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ABSTRACT

The booklet provides information for the design and evaluation of a barrier free outdoor environment for handicapped individuals. Section 1 discusses the scope of the study, defines terms, cites pertinent laws and legislation, describes cost/benefit factors, and surveys population statistics. Section 2 considers recommended design details in the following areas: basic human consideration; general site accessibility; walks and intersections, ramps, stairs, and handrails; walls, gates, fences, and railings; waiting areas, drop-off zones, and parking; vegetation considerations; signage considerations; lighting considerations; recreation considerations; site furniture; and bicycle considerations. Section 3 consists of the following appendixes: population data; a chart of handicap/site element relationship; current legislation (by state); a list of individuals and organizations contacted for information; and a bibliography of information about the handicapped, (including government publications, research and foundation publications, periodicals, and books). (PHR)

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barrier free site design

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The American Society of Landscape Architects Foundation

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Introduction

Convenient access to the outdoor environment is frequently denied to many people in our society because of the manner in which outdoor elements are designed and constructed. Every person can expect to be physically handicapped either temporarily or permanently at some time during their lifetime. A mother pushing a baby carriage, a shopper whose arms are loaded down with packages, a child pulling a wagon, and a pregnant woman may find themselves unable to cope with a flight of stairs, a curb, or a door because of the design of these objects.

These people may expect to be relieved of their handicaps within a fairly short length of time, unfortunately, there are also those who, through a permanent handicap, will always be inhibited in their movements.

The total number of permanently disabled people is growing dramatically. The primary reasons for this are better medical treatment and care, and as a direct result of this, increased longevity. With people living well into their seventies, eighties, and nineties, it may be expected that the opportunity for a traumatic injury or a debilitating disease during their lifetime is greatly increased. Also, the wars that have occurred in our recent history have created large numbers of disabled people.

In the past, the basic attitude of the general population toward those with various disabilities was, "Out of sight — out of mind." Current attitudes place more emphasis upon encouraging disabled people to lead more productive lives and to avail themselves of educational opportunities. Concomitant with this, a national effort is being made to employ the handicapped. This, of course, requires that those with disabilities must be able to go easily to a place of education or employment. However, while barrier-free architecture, at least in public buildings, is becoming a reality through federal, state, and local codes and legislation, provisions to assure barrier-free site design have for the most part been neglected. This inadequacy has not been as intentional as it has been accidental. Standards, details and other design configurations which have limited the accessibility of impaired people in the exterior environment, have usually been in common usage for years, and simply have not been examined as to their appropriateness.

Most landscape architects and other environmental designers desire to make their designs accessible to the handicapped, but must be made aware of the standards and guidelines that are necessary to do so. At present, the individual designer asked to design facilities for the disabled person has few ready sources of reference. Although much work and study has been done on the subject by government agencies on state and local levels, independent institutions, and a number of design firms, the work is so scattered as to be of little use. There has been a need for the development of a centralized reference for the sharing of basic resource material for the design of site facilities.

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The following organizations and individuals have contributed directly to the production of this publication.

1. **U.S. Department of Housing and Urban Development:** Washington, D.C. Mr. Charles Gueli, Director, Community Design Research Program and Government Project Manager

   Special acknowledgement and appreciation must be expressed to Mr. Gueli for his insight, perception and guidance on this project. Ms. Deborah Greenstein and Mr. Larry Kirk of HUD have provided valuable input and review data throughout the course of the research and development phase of the project. In addition, Ms. Marie McGuire Thompson of ICSG and Dr. Morton Leeds of HUD have reviewed and guided the research and development of the final publication.

2. **American Society of Landscape Architects Foundation:** McLean, Virginia. Mr. Gary O. Robinette, Executive Director
   As project director, Mr. Robinette was responsible for coordination between the many parties involved in the production of the publication and was responsible for much of the text development as well. Research Associates for the ASLA Foundation were Mr. Jay Jorgensen, ASLA representative on the Architectural Barriers Committee of the President's Committee on Employment of the Handicapped, and Professor Alan Winslow, Chairman of the program of Landscape Architecture at Virginia Polytechnic Institute and State University. These gentlemen provided the basic data from which the design recommendations and guidelines were established.

3. **Johnson and Dee – Landscape Architects** Avon, Connecticut: Mr. Richard K. Dee, Principal in Charge
   The firm of Johnson & Dee was assigned responsibility for the "translation" of raw research data into the final printed book. Their services included editing of text material from raw and rough draft form, development of additional text and standards where necessary, formulation of the graphic design format, preparation of all graphic illustrations and assembling of camera-ready mechanicals for printing.
   As the supervising partner, Mr. Dee was assisted by Mr. Gary Hath, Ms. Jacquelin McBride and Mr. Christopher Nothstine.

4. At several points during the course of the study, the material gathered to that date was presented to panels of reviewers for their comments on its completeness, accuracy, and appropriateness. These panels consisted of designers, administrators, persons with specific handicaps, educators, and members of both public and private groups organized to represent handicapped persons nationwide. **Review panels** have included the following people:

Bert Anderson, U.S. Dept. of Housing and Urban Development

Melville J. Appell, U.S. Dept. of H.E.W., Bureau of Education of the Handicapped, Division of Research

Richard Austin, Kansas State University

Richard Blakeley, University of Wisconsin, Department of Landscape Architecture

Paul Carr. The Community Group Corp.

Pat Cass, U.S. Department of Transportation

Richard [illegible], Johnson and Dee, Landscape Architects

James Gashel, National Federation of the Blind

Ginger Hale, SSA, BHI

William A. Hillman, Jr., Bureau of Education for the Handicapped, Division of Training Programs

Jerry Hitzhozen, National Recreation and Park Association

Samuel J. Hodges, III, U.S. Department of Housing and Urban Development

Dean Johnson, Johnson and Dee, Landscape Architects

William Kirwin, Smith/Kirwin

Marcia Lacy, Psychiatric Institute of America

Peter L. Lassen, U.S. Veterans Administration

Ira Laster, UMTA, Department of Transportation

Edmond Leonard, President's Committee on Employment of the Handicapped

Harriet Miller, N.R.T.A. – American Association of Retired Persons

Ashot Mnatzakanian, DDD/RSA/Department of Health, Education and Welfare

M.D. Myers, F.E.C.A./Department of Health, Education and Welfare

Donald Molnar, University of Illinois

Robert L. O'Boyle, Robert L. O'Boyle Associates

David Park, National Recreation and Park Association

Allen Sarodkin, SSA/BHI

Julian Stein, American Association for Health, Physical Education and Recreation

Edward H. Stone, II, U.S. Forest Service

Frederick C. Terzo, The Rouse Company

Thomas B. Thompson, Architectural Consultant

Roberta Van Beek, National Easter Seal Society for Crippled Children and Adults

Jean Wasmann, U.S. Department of Housing and Urban Development

Doris Wright, The Community Group Corp.

John Womack, U.S. Department of Housing and Urban Development

Robert Zolomij, University of Illinois

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Study Background

Purpose of Study

The purpose of this publication is to provide in one source, for both administrators and designers, the necessary information that can lead to designs that consider all persons using the outdoor environment. It is not intended that it should present rigid guidelines or standards, but rather it should act as a medium of sharing information.

This document is meant to be used as a tool for design and evaluation by administrators, landscape architects, architects, engineers, handicapped people with an interest in accessible exterior facilities, maintenance personnel, local concerned groups, and other interested people.

It is hoped that it will assist anyone who may be inadvertently preventing handicapped people from enjoying total access to the environment because of a lack of knowledge of pertinent guidelines or details.

Content of Study

The information presented within this publication relates to the following areas:

1. The status of federal and local legislation, both past and present in making the exterior environment more accessible. A profile of current legislation and requirements enacted by individual states is provided in Appendix C.
2. The relationships of the costs in providing barrier-free access for both existing and proposed construction.
3. Information regarding the amounts, types and characteristics of handicapped people within our society and the means for gathering additional statistical information.
4. Details of how site elements such as steps and ramps, seating, handrails, parking stalls, waste receptacles, and site lighting may be designed so as to be usable by the handicapped. Guidelines, planning considerations, and coverage of the inter-relationships between site elements, architecture, and transportation systems are included. The document does not deal with the interior aspects of buildings nor with the actual systems of transportation since much has been published on this already. Neither does it deal with handicaps of such severity that the individual is completely unable to use the outdoor environment without extreme assistance.
5. Finally, suggestions of where to look for additional information; the names of organizations, agencies, institutions, publications, and people or projects that have been helpful during the study are listed at the end of this publication.

Study Methodology

The methodology for this study included the collection of information concerning population groups with various handicaps, the study of physical constraints manifested by various disabilities, and the gathering of details and planning studies which have been related to making the exterior environment more accessible to the disabled. After the basic standards, guidelines, details, and site plans were gathered, they were compiled, organized, edited, and were then supplemented by papers and documents prepared by various designers, recreational therapists, physical therapists, and other specialists who served as consultants to this study. This material has been assessed, appraised and altered where necessary by representatives of design organizations, governmental agencies, and groups representing handicapped populations in informal review seminars conducted as part of the study.

In addition to the digested information presented in the publication the reader is now holding, a larger report is presently being developed and will include the majority of basic research material as well as a variety of case studies and "back up" information. The publication is scheduled for completion in early 1975 and will be on file at the HUD Office of Policy Development and Research and can be obtained through the Government Printing Office in Washington, D.C.

Definition of Terms

For the purpose of this study, it has been necessary to define particular handicaps, impairments, and restrictive devices so that they may be related to individual design elements. The terminology used below, with the exception of "temporary impairments," is generally accepted and used in literature dealing with the handicapped.

1. **TEMPORARY IMPAIRMENTS**
   Temporary impairment refers to any and all situations in which people become temporarily restricted in their movements either through a disease or trauma that requires time to heal, or simply in performing the normal functions of everyday life. The pregnant woman, the shopper with his arms loaded with packages, the skier with a broken leg, and the woman wearing high heel shoes are all "handicapped to a degree" in their movements, but the duration of their impairment is relatively short-lived.
2. **ACTIVITY IMPAIRMENTS**
   The term **activity impairment** generally refers to any sort of limitation which curtails the normal activities of a person. Most often diseases of the heart, lungs, or forms of arthritis and rheumatism are involved. Visual, audial or mobility curtailment are not included. In general, people with activity impairments cannot play strenuous games or engage in unlimited physical activity.
3. **MOBILITY IMPAIRMENTS (MOBILITY "A")**
   A **mobility impairment** curtails the ability of movement or ambulation. It may be caused by

such things as partial paralysis which has not been compensated for by the use of ambulatory aids, or the absence of extremities which have not been replaced by mechanical aids. Disabilities, deformities, or handicaps which curtail the movement of the person are included in this category.

4. MECHANICAL AIDS (MOBILITY "B")

a. Wheelchair
A wheelchair is a chair on wheels normally propelled by the occupant by means of handrims attached to the two side wheels. Wheelchairs may also be motorized or propelled by an attendant.

b. Crutch
A crutch is a staff with a crosspiece at the top to support the person in walking. The point of support may be under the shoulder, upper arm, or forearm. For each crutch, a second support is provided at hand level.

c. Cane
A cane or walking stick is a short staff either straight or curved at the upper end, used to provide some support at hand level in walking.

d. Walker
A walker is a four-legged stand which provides support for the user. It is moved by lifting or by wheeling on casters.

e. Brace
A brace is defined as any kind of supportive device for the arms, hands, legs, feet, back, neck, or head, exclusive of temporary casts, slings, bandages, trusses, belts, or crutches.

f. Artificial Limb
An artificial limb is a device to replace a missing leg, arm, hand, or foot. It does not necessarily have moving parts. A device employed only for lengthening a leg where the whole leg or foot is present is not included in this definition.

g. Special Shoes
Footwear specifically designed as podiatric aids to be used in assisting people in walking.

5. MANUAL IMPAIRMENTS

a. A **partial manual impairment** entails the impairment of either both hands to a certain degree, or total disability of one hand. It may refer to the lack of a replacement of a missing hand or arm with a mechanical device. There is some use of hands or arms, and some manual dexterity in a partial manual impairment.

b. A **total manual impairment** means, in effect, that the person has no use of his hands or arms. Therefore, he is handicapped in those aspects of the exterior environment which require the use of these extremities. It may be the result of arthritis, rheumatism, amputation, or the lack of replacement of a limb by artificial devices.

6. VISUAL IMPAIRMENTS

a. Partial visual impairments are usually caused by dysfunctions such as color blindness, the loss of partial sight in one eye, cataracts, glaucoma, a detached retina, or congenital birth defects. A worsening of some of these problems may cause total visual impairments.

b. A **total visual impairment** means that a person has total loss of vision.

7. AUDIAL IMPAIRMENTS

a. Partial audial impairments include people with a limited ability to hear, but who are still able to detect major sounds such as loud noises or audial warnings in the exterior environment.

b. A person with **total audial impairment** cannot hear any sounds at all. Congenital birth defects, disease, or a steady audial deterioration which culminates in total deafness in old age are the usual causes.

8. MENTAL RETARDATION
Mental retardation is defined today as a subaverage intellectual functioning which originates during the developmental period and is associated with impairments in adaptive behavior. In less technical terms, the mentally retarded person is one, who from childhood, experiences unusual difficulties in learning and is relatively ineffective in applying whatever he has learned to the problems of ordinary living. Degrees of mental retardation (mild, moderate, severe, profound) are measured by considering both measured intelligence and impairment in adaptive behavior.

Laws & Legislation

In virtually every nation, the number of handicapped individuals has been increasing significantly. In the United States alone, statistics reveal that the handicapped constitute well over 10 percent of the population. In addition to the deaf, blind, mentally retarded and the victims of various diseases, the numbers are swelled by the survivors of several wars, accident victims and the disabled elderly. Advances in the medical sciences and population increases have also had their impact.

For many years, the establishment of institutions was accepted as being the best and most economical means of doing something for, and with the handicapped. These people were often confined in dreary Dickensian places to be forgotten by the rest of society. Frequently receiving meager care, the handicapped had little hope for the means and opportunities to live publically useful lives.

Out of a growing public awareness of the handicap problem, and through the work of many government and private organizations, evolved a national attitude that the handicapped should be given the chance to lead more fruitful lives with provisions and opportunities for obtaining as satisfying a life style as possible. Institutions are still necessary for those needing complete care, but they should not be the only places for the handicapped. Thus, an emphasis on assimilating the handicapped into normal society began to take shape during the late '50's and early '60s. The key elements in this normalization process were the goals of providing the handicapped with access to housing, public and private facilities, recreation and transportation.

To further the process of bringing the handicapped and disabled back into society, a vast spectra of legal machinery has been created. Its main purpose is the removing of physical barriers which have, in the past, prevented handicapped persons from gaining access to those public and private facilities which are necessary for leading a normal life. The system by which this legal machinery was formed is a process in itself. It usually begins with the development of guidelines by non-governmental organizations, such as the National Easter Seal Society and others, who have specific interests in certain types of handicaps. Their interests are with the problems that people having these particular disabilities experience when they move through buildings or the outdoor environment. Generally, these guidelines are in the form of recommendations, developed and researched privately, distributed to the public freely, but have no legal force or binding character. Fortunately, many State and Federal agencies have adopted some of the most appropriate guidelines as the basis for their requirements and ordinances concerning the design and construction of both publicly owned and publicly used facilities.

Initial Recognition

An early major breakthrough concerning national recognition of a non-governmental guideline came with the **Specifications for Making Buildings and Facilities Accessible to and Usable By The Physically Handicapped**, developed in 1961, by both the President's Committee on the Employment of the Handicapped and the National Easter Seal Society. The specifications were in turn adopted by the American National Standards Institute (ANSI 117-1-1971) and at present serve as either the total or partial basis for laws concerning accessibility for the handicapped in the majority of state governments.

Other non-governmental bodies which have had success in developing widely accepted guidelines to provide for an accessible environment are the **National Model Building Codes**, such as those of the Building and Code Administrators (BOCA), the International Conference of Building Officials, and the Southern Building Code Officials.

President's Committee

The President's Committee on the Employment of the Handicapped is an advisory, rather than administrative, agency with responsibilities in programs utilizing architectural criteria, standards or guidelines. The Committee includes an Architectural Barriers Committee which seats members from all of the major environmental design fields. For years, this Committee has evaluated and promoted discussion, suggestions and recommendations as to the possible means of removal of architectural and environmental barriers to handicapped persons. It has worked with ANSI and the National Easter Seal Society for Crippled Children and Adults to make available the ANSI Standards to a wide spectrum of persons with an interest in this particular subject. The Committee has also printed a wide variety of publications dealing with barrier-free design, and coordinated the efforts of thousands of volunteers around the country to break down environmental barriers.

Early Legislation

The Department of Health, Education and Welfare (HEW) reported in 1960 that 30 million Americans had physical disabilities which seriously limited their full and free use of the environment. Most of these people were living in housing which did not allow, or had to be specifically remodeled to allow, independent living, and in which additional restrictions on the use of outdoor spaces and public transportation existed due to an overall lack of accessibility. This report was of monumental importance in rallying support for handicapped-related legislation.

The first federal legislation designed to deal with the problems exposed by the HEW Report was **the Housing Act of 1964,** which provided a wide range of federally-assisted programs to help meet the need of suitable housing for the handicapped. Under this act, HUD required that 10% of the units in housing projects for the elderly, which have been assisted or insured by HUD, must be accessible to the physically handicapped.

Another milestone of federal legislation in regard to access for the handicapped, is **Public Law 90-480,** passed in August 1968, more specifically entitled **"An Act to Ensure that Certain Buildings, Financed with Federal Funds are so Designed and Constructed as to be Accessible to the Handicapped"** (42 U.S.C. 4151) as amended. In addition, the **Federal Property Management Regulations**, Chapter 101, Sub-Part 101-17-7, entitled **Combinations for the Handicapped** (41 CFR 101-17-7) was developed by the Office of Management and Budgets, and promulgated as a basic administrative guideline. To date, these two laws, together with the Housing Act of 1964, have been directly responsible for enabling the funding of 452,000 subsidized and 49,000 unsubsidized dwelling units of elderly housing, of which at least 10% were designed for occupancy by the physically handicapped. In addition, 7 projects totaling 1,000 units have been built specifically for the handicapped. Therefore, approximately 50,000 dwelling units have been approved or built for the physically handicapped since 1969, and it is estimated that 4 times that number have been built by State and local housing authorities during the same period.

Current Legislation

Today there are several major guidelines and legislative acts prepared by governmental bodies at a variety of levels. Primary among these are the **HUD Minimum Property Standards** (MPS) which have been developed for multi-family housing (4910.1-1973) as well as for 1-and-2-family dwellings (4900.1-1973) and for care-type housing (4920.1-1973). These standards have been coupled with a **Manual of Acceptable Practices** (4930.1-1973) to indicate how buildings and site facilities for the elderly in HUD-insured or assisted projects should be designed and constructed to assure their barrier-free accessability.

In September 1973, **The Rehabilitation Act of 1973** established the Architecture and Transportation Barriers Compliance Board to ensure adherence to earlier federal legislation. As of April 1974, it is being activated by the Department of Health, Education and Welfare and the General Services Administration.

The Veterans Administration (VA) in its **VA Construction Standard CD-28 of October 1973,** entitled **Accommodations for the Physically Handicapped,** designates some of the ways that VA facilities need to be altered or designed initially to accommodate the handicapped and disabled.

The **Building Officials and Code Administrators (BOCA) Building Code** was modified in June 1974 to deal with provisions for the physically handicapped and aged. These recommendations are widely accepted and incorporated into, or serve as, the basis for most local building codes.

The most recent addition to federal legislation that attempts to deal with problems of access for the handicapped is the **Housing and Community Development Act of 1974.** Although the Act concerns itself primarily with providing funds for projects that will promote housing and general community development, there are two sections which are of particular importance to the handicapped. The first deals with the application and review requirements that must be met before a grant will be conferred. It states, "No grant may be made unless an application shall have been submitted in which the applicant accurately surveys the condition of the housing stock in the community and assesses the housing assistance needs of lower-income persons (including elderly and the handicapped . . ," (104.14A). The second deals with the programs eligible for assistance and states, "A community development program assisted under this title may include special projects, directed to the removal of material and architectural barriers which restrict the mobility and accessibility of elderly and handicapped persons," (105.a5).

In 1974, HUD undertook the development of new standards for making dwelling units accessible to and usable by the handicapped. The program is aided primarily at up-dating and up-grading the original ANSI Stanuards developed in 1961. The department awarded a contract for development and testing of these new specifications in mid 1974 with the expectation that new recommended standards will be available in late 1975, and with final testing and evaluation to be completed by late 1976. These new specifications are intended to cover interior and exterior spaces for both public and private structures.

Both the Department of Health, Education and Welfare and the General Services Administration, through the Public Buildings Service, have Federal governmental guidelines for accommodating handicapped persons. The Department of Health, Education and Welfare, through the Health Services Administration, the National Institutes of Health, the Rehabilitation Administration and the U.S. Office of Education deal with the health, rehabilitation, education and training of disabled children and adults.

State Legislation

Many Federal programs which provide funds for construction of state and local community structures have specific criteria and standards of accessibility built into them. These programs include the construction of hospitals, agricultural and recreational facilities, schools of all types, rehabilitation centers, and libraries and college facilities, and are administered by as many as 30 various governmental agencies having construction authority or the authority to dispense construction funds.

State governments have made considerable progress in recent years in their efforts to make publicly-owned, and privately-owned but publically used, buildings and facilities accessible to the handicapped. Such efforts have been directed by statutory requirements in 49 states. In several of the states which have enacted legislation relative to architectural barriers, state regulating agencies have been directed to promulgate rules and regulations which were subsequently incorporated into buildings or other codes. **Appendix C** of this publication gives an overview of current state legislation throughout the United States.

The State of North Carolina in the **State Building Code,** Vol. 1, General Construction, Section (11x) has developed a publication entitled **Making Buildings and Facilities Accessible To and Usable By the Physically Handicapped.** This document was published by the North Carolina Building Code Council and the North Carolina Department of Insurance. Dozens of other publications have been developed by local government offices, voluntary agencies, advocacy groups and designers.

The State University of New York, through the **State University Construction Fund,** has prepared a publication entitled **Making Facilities Accessible to the Physically Handicapped — Performance Criteria.** The Bureau of Outdoor Recreation of the Department of the Interior and the New York State Council on Parks and Outdoor Recreation have prepared separate documents setting standards on outdoor recreation for the physically handicapped. The Committee to Eliminate Architectural Barriers in Westchester County has prepared a document entitled **Construction Detail Planning for the Handicapped.**

The State of Massachusetts has been rather progressive in its development of legislation to aid the handicapped. Three Acts passed by the Massachusetts Legislature deal specifically with the handicapped and related problems. The first, and most comprehensive, is **Chapter 812 of the Acts of 1970.** This pioneering state legislation, in many ways parallels Federal laws and regulations that are designed to establish housing opportunities for the handicapped. It provides that within the context of the State's low income public housing for the elderly projects, "single handicapped persons or families of one or more persons, one of which is handicapped, shall be eligible for admissions to such housing regardless of age." It further states that the handicapped "shall receive priority in placement in no less than five percent of low income for construction initiated after January 1, 1971. This law also provides that the word "handicapped" is not to be limited solely to the physically handicapped, but shall include other restrictions as well.

The second item is **Chapter 689 of the Acts of 1974,** which authorizes the Massachusetts Housing Finance Agency to develop housing for the handicapped and establishes within the Department of Community Affairs, a Bureau of Housing for the Handicapped.

The third item, **Chapter 827 of the Acts of 1971,** provides that "certain buildings that are open to and used by the public shall be constructed so as to facilitate the use thereof by the handicapped."

International

Internationally, a British publication entitled **"Access for the Disabled to Buildings, Part I, General Recommendations", British Standard Code of Practice,** CP 96: Part I: 1967, covers in detail and in somewhat different terminology, the background of the elimination of architectural and landscape architectural barriers for the disabled in Great Britain. Standards have now been developed in at least 17 other countries around the world, including Canada, Holland, Sweden and Australia.

In addition to developing national standards, many nations have had to find independently financed programs to deal with the handicapped because of a lack of governmental funding. HUD's Inter-Departmental Task Force for the Handicapped in conjunction with the Office of International Affairs (OIA) conducted a survey of

10 foreign programs throughout Europe and North America. An article on their findings was printed in the **HUD International Information Series** (HUD-322-16-1A) and offers an excellent summary as reprinted below:

"The countries surveyed were Australia, Canada, Denmark, the Federal Republic of Germany, Mexico, the Netherlands, Norway, Sweden, Switzerland and the United Kingdom. Each country was found to have varying arrangements for the housing and care of the handicapped, plus institutions for those needing complete care. In all countries, the special facilities created were found to be far less costly than purely institutional care, while providing many more services and amenities.

"In the United Kingdom, local housing authorities, Regional Hospital Boards, and voluntary agencies provide various types of housing and care varying from country estates to institutions. Norway and Switzerland often incorporate residential homes as annexes to other institutions such as nursing homes, clinics, training centers or workshops.

"In Sweden, the Government has assumed financial responsibility for the handicapped and provides a disability pension based on ability to work. The Swedish Fokus Society, a non-profit group that has developed housing for the severely disabled, attempts to integrate the handicapped into city life. Denmark is experimenting with apartment houses that include units equipped for the handicapped. Both Denmark and Sweden have programs to train and pay family members to care for the handicapped in their own homes. Germany has a program similar to Sweden's and has developed a Fokus-type society with the same aims as the Swedish group.

"The Netherlands has built a village reported to be the world's first designed especially to provide the physical and social environment needed by the handicapped. Called Het Dorp, it is intended for disabled persons over 18 whose handicaps are so severe they cannot live alone.

"The Canadian Government helps finance group housing projects under the Canadian National Housing Act. Experiments are being done with group homes and residential dwellings where small groups of up to 10 persons live under the supervision of a trained couple. The homes also fill the role of "halfway houses" between the hospital and a permanent home. Australia has developed hostels for paraplegics which can also accommodate handicapped students in vocational training or educational programs. In addition, the hostels provide temporary housing for paraplegics when travelling. In Mexico, a physician has converted a motel near Guadalajara to fill a variety of needs from temporary to permanent housing for the handicapped."

Cost/Benefit of Barrier-Free Construction

Frequently, the anticipation of extreme costs has stifled discussion and more thorough evaluation of the incorporation of considerations for the handicapped into new construction projects. Even greater anxiety is attached to the likely costs in correcting already-built situations. This apprehension continues, due mostly to the lack of research into the cost/benefit aspects of barrier-free construction. Recent studies have begun to bring information to this subject which indicates that earlier assumptions of costs were, in fact, exaggerated.

In a study undertaken by Perkins and Will, Architects, on the costs of barrier-free construction, an analysis of a questionnaire sent to local officials and architects revealed two important points. First, that the cost to eliminate architectural barriers would not have been an important consideration to cities and counties that have undertaken projects that have proven to be restrictive to the handicapped. Second, that less than 10% of the architects surveyed, felt that a building constructed to be fully accessible to the handicapped would be prohibitively costly. In support of this is a study conducted by the Department of Urban Studies, National League of Cities, Washington, D.C. (1967), in which several buildings, both existing and hypothetical, were studied as to the specific costs involved in making them barrier-free. Elements considered in the estimate were basic to accessibility, and conformed to the specifications set forth in the American National Standard Institute's **Specifications for Making Buildings and Facilities Accessible To, and Usable By, the Physically Handicapped**. Also, the elements were designed so as not to curtail any normal functions or detract from the aesthetic appearance of the buildings.

Of the 3 new existing structures studied, it was estimated that each building could have been constructed in such a way as to provide total accessibility for less than 1/10 of 1% of total construction costs. Likewise, 6 of the 7 hypothetical buildings studied could have been constructed barrier-free for less than 1/2 of 1% of the original construction costs. Although this study does not relate directly to costs of site accessibility, it may be surmised that the price of making a site barrier-free would be even less, since modifications to buildings are likely to be more extensive than site renovations.

There seems to be little doubt that the inclusion of elements in new construction that insure barrier-free design do incrementally increase costs. However, analysis indicates that the additional money necessary for such construction is relatively small. In the cases studied by McGaughan and Johnson, it proved to be substantially less than 1%.

Remodeling

The same analysis to original construction costs is difficult to make on existing projects which require renovations to allow access by handicapped groups. Since a project may have been constructed many decades ago, a direct comparison of current corrective costs will bear little relationship to costs incurred during its original construction. In addition, current situations and demands may have placed use requirements on the facility which were not originally intended or anticipated. Thus, it is difficult to draw a direct comparison between original construction costs and the costs today of renovating a site situation for access by the handicapped.

Nonetheless, the concept remains that our environment must be made accessible to our whole population. On projects not yet built, appropriate considerations should be incorporated to meet this responsibility. In addition, we must evaluate our existing environment and eliminate those barriers which exist. Unfortunately, we cannot find the comfortable solace with existing situations as we can in incorporating sympathetic design into future construction. The cost of un-doing barriers in our existing

environment must be carried within established maintenance budgets and budgets for capital improvements. The cost cannot be buried into a long column of larger construction costs to appear smaller. Rather, it must come from an understanding and acknowledgment by the public that these areas must meet the requirements of our increasing population. In most cases, pressures for use of a site have intensified beyond the population originally intended to be served. Here, the benefits of any corrective construction will be realized by more users than originally planned.

There appears to be little evidence to support a claim that the costs of new barrier-free construction should negatively influence the decision-making process of whether barrier-free elements are to be included in a project. On one hand, the minor cost increase involved is a small price to pay for increased accessibility. The study findings also show that increases are so insignificant if included in the original construction that both public and private construction budgets should be able to meet the additional costs with little or no apparent hardship. In addition, the Housing and Community Development Act of 1974 has explicit requirements for the provision of barrier-free architecture and site design along with the machinery to provide for the funding of such construction. As was previously discussed in "Current Legislation" of the preceding "Laws and Legislation" section, the Act covers two items of importance concerning the public funding of barrier-free site design. The first deals with the initial application and review requirements necessary for obtaining a grant. Section 104.4(A) states that "an accurate survey of the condition of housing in the community and the housing assistance needs of lower-income persons (including the elderly and handicapped) residing in or expected to reside in the community" has to be submitted before any financial assistance can be approved. The second item, Section 105.5 states that "assistance can be obtained for special projects in a community, directed to the removal of material and architectural barriers which restrict the mobility and accessibility of elderly and handicapped persons."

Within the private sector, the costs involved with making existing structures accessible must be weighed against the benefits of complete accessibility. With our residential developments being designed at increasing densities, the ultimate benefit of any consideration for the "handicapped" not only provides ease of movement for the general public, but increases the potential consumer market to include those with actual handicaps as well. With the statistics given earlier, one can see that the numbers of people that would become eligible "customers" to facilities so designed and that are presently being ignored would be substantial. But, aside from the potential economic gains of opening areas to the handicapped groups, we must ultimately meet our moral responsibility of providing total access to our public spaces. This is especially appropriate when one stops to consider that the very dollars spent for the construction of public spaces came in part from physically restricted people.

Population

The design and construction of facilities that are totally accessible to all people is a highly desirable goal for which environmental designers should strive. This challenge and responsibility is made more difficult due to the lack of coordinated legislation and the lack of thorough implementation of those guidelines which are in existence. In addition to this is the lack of awareness by the general public for requirements needed by both the permanently and the temporarily handicapped.

One of the single most influential tools to be used in knowledge of the accessible design is the number of people with various types of permanent impairments in a given geographical area. This will establish at least to a certain extent, the priority for designing facilities to provide handicapped persons with full access to exterior site activities and facilities.

For designers and administrators concerned with the problem, statistics provide the best assistance in answering the following types of questions:

- Where impaired people are located within a given region.
- How many handicapped people there are in a particular area.
- What types of disabilities they have.
- How much of an impairment the disability entails.
- What age groups they represent.
- What constraints these handicaps cause for the people using site areas or elements.
- What considerations should be made in the design of facilities for people with this handicap in terms of design, location, alteration or cost.

With answers to these questions, a more realistic and competent decision can be made as to the extent the handicapped should be considered in a design. The designer and adminstrator should be reminded, however, that most statistics have been developed to include only the permanently handicapped, and frequently disregard, or fail to mention the group of our population which is temporarily handicapped. Each year, many persons must temporarily limit their movements to a wheelchair or crutches due to sporting injuries or other inadvertent mishaps. While their activity is restricted for only a few weeks or months, they are nevertheless just as handicapped for that time period as are those whose handicaps are permanent.

The charts shown on the following pages, and in Appendix A, present current statistics which were gathered during this study. They are included as a way of illustrating the magnitude of populations which will be affected by a more conscientious effort to include their requirements in designing the outdoors.

Sources of Information

Among the problems in determining the number of people with a particular type of disability, is the great variety of source, the disparity among data, and the difficulty in interpolation among the various methods of record keeping. Each organization or agency, organizes and collects statistics in an individual way to be used for its own purposes. Since there is no simple way in which the individual site designer or administrator concerned with the design of exterior site facilities could conduct the necessary basic data collection on his own, he must rely upon existing sources of information and existing methods of data collection with the understanding that they have a built-in bias.

The following are a few of the government agencies collecting data on handicaps and impairments, disabilities, or uses of special aids:

- **U.S. Census Bureau**
  Numbers, percentages of disabled in the population
- **Social Security Administration**
  Work limitations.
- **National Center for Health Statistics**
  Raw data oriented toward health care.
- **Veterans Administration**
  Benefits, facilities, care.
- **Rehabilitation Services Administration (HEW)**
  Rehabilitation needs.
- **U.S. Office of Education**
  Educational limitations.

Private organizations representing the handicapped also maintain certain statistics concerning those persons with the particular handicaps in which the organization is interested. Addresses of these groups and others with an interest in specific disabilities are found in the back of this book in Appendix D.

Any population figures are subject to interpretation and must be translated into design terms on the local level. Environmental designers wishing to find more precise local information concerning the number of handicapped persons in their particular state, region, or city should contact the federal agencies compiling statistics in these areas. These agencies may be able to provide the local information. In other instances state health departments or state committees for the employment of the handicapped may have exact information concerning the number of persons with particular impediments in an area. Both local and national organizations representing particular types of handicapped people should also be contacted for specific information where needed.

Methods of Classification

As mentioned previously, one of the problems in seeking information concerning the numbers of people with handicaps relates to the variety of methods for record keeping. There are probably more types of record keeping than there are agencies involved in keeping the records. These organizational systems range over the following spectrum:

- Classification of impairments.
- Work disability — occupational disability/secondary work disability.
- Educational disability.
- Severity of disability.
- Functional limitations measurement.
- Social assistance requirement.
- Chronic conditions.
- Limitations of mobility.
- Sensory limitations.

The most commonly used classification has been referred to as the **"X-code."**

It was developed by the Division of Public Health Methods in 1955 and 1956. Its purpose is to provide, in the relatively simple detail required for household health surveys, a method for coding certain residuals of diseases and injuries. With this method, both the present effect and underlying cause can be reflected within one diagnostic code.

Population Statistics

It is rather obvious that no statistics would be available regarding people with the types of temporary handicaps that have been discussed earlier in the book. However, it is certain that each and every person at literally hundreds of points in his life, will be handicapped to one degree or another, although the handicap may be short-lived.

The document **Chronic Conditions and Limitations of Activity and Mobility,** United States, July 1965; June 1967, published by the National Center for Health Statistics, indicates that there are 21,984,000 persons with activity limitations of various types. Not all of these, however, relate to the use of exterior site facilites, since many of these people are not able to leave the confines of their home or the area immediately surrounding their home.

There are a number of ways to determine usable figures concerning activity limitations. For example, this NCHS publication lists 12,928,000 persons with limitations in one or more activities. These are categorized into lifting or carrying weights, stooping, kneeling, crouching, using stairs or inclines, walking, reaching, handling, fingering or writing.

Among the diseases or infirmities causing activity limitations are: diabetes (562,000); heart condition (3,600,000); arthritis and rheumatism (3,248,000); impairments upper extremities (410,000); high blood pressure (966,000); and multiple sclerosis (102,000).

In regard to mobility handicaps, it is possible to index the disability creating the handicap and also to find statistics concerning the number of persons who are not able to perform certain functions of movement. The document **Chronic Conditions and Limitations of Activity and Mobility,** mentioned above, gives statistics of impairments as related to cause of disability.

The National Center for Health Statistics (1969) has compiled very careful, complete and accurate statistics relating to mechanical aids. These figures are as follows:

• Wheelchair	409,000
• Crutches	443,000
• Canes	2,156,000
• Walkers	404,000
• Braces	1,102,000
• Artificial Limbs	172,000
• Special Shoes	2,337,000

Because people with either partial or total manual disabilities are handicapped to a varying degree in their use of site elements, it is extremely difficult to find accurate figures on the number of persons with various types of manual handicaps. Therefore the statistics provided relate to general categories such as ability to write, difficulty in reaching, or in carrying weights, et cetera.

Although there are some areas of disagreement concerning the number of people with visual problems, there seems to be a much greater consensus and a more complete means of data gathering than with other handicaps.

According to the document **Prevalence of Selected Impairments,** United States, July 1973; June 1965, published by the National Center for Health Statistics, there are 5,390,000 people in the United States with some degree of visual impairment. Of these, 4,105,000 can be considered to have at least 25% visual impairment, 184,000 people have approximately 50% visual impairment, and 618,000 people have approximately 75% visual impairment. There are, as well, 483,000 people with a total visual disability.

The same sources indicate that there are approximately 8,088,000 people with partial hearing problems, and 461,000 people with nearly total hearing deficiencies.

Material from the 1970 **Census of Population,** U.S. Department of Commerce, Bureau of Census, indicates that there are 515,000 people under the age of 5 years with some degree of mental retardation. In addition, 1, 343,154 people between the ages of 5 and 15, 655,677 people between the ages of 16 and 21, and 3,581,130 people over 21 are mentally retarded to some degree. The Council for Exceptional Children presently indicates that there are 1,388,300 children between the ages of 5 and 19 years with mental retardation problems in the United States.

As to the overall extent of persons with varying degrees of physical restrictions in the United States, the National Center for Health Statistics has made the following observation:

> "At least 67,900,000 Americans suffer from limiting physical conditions and would benefit from a more accessible environment. An additional 20 million or more Americans over the age of 65 and limited in mobility as a result of the aging process are not included in this figure."

When compared to our national population of over 200 million, it is astonishing to think that physical barriers in the environment are limiting the activities of more than one out of every four Americans.

Summary

A typical statement of today's concern for the plight of the physically handicapped is one developed in early 1974 by a Task Force of The American Institute of Architects, The President's Committee on Employment of the Handicapped, and the National Easter Seal Society for Crippled Children and Adults. Utilizing a series of consultants from interested and related organizations, they drafted a **National Policy for a Barrier Free Environment** quoted as follows:

"In the United States today, it is estimated that 1 out of 10 people has limited mobility due to a temporary or a permanent physical handicap. Improved medical techniques and an expanding population of older people is increasing this number every year. Yet, in general, the physical environment of our Nation's communities continues to be designed to accommodate the able-bodied, thereby, increasing the isolation and dependence of disabled persons. To break this pattern requires a national commitment.

Therefore, it shall be national policy to recognize the inherent right of all citizens, regardless of their physical disability, to the full development of their economic, social, and personal potential, through the free use of the man-made environment.

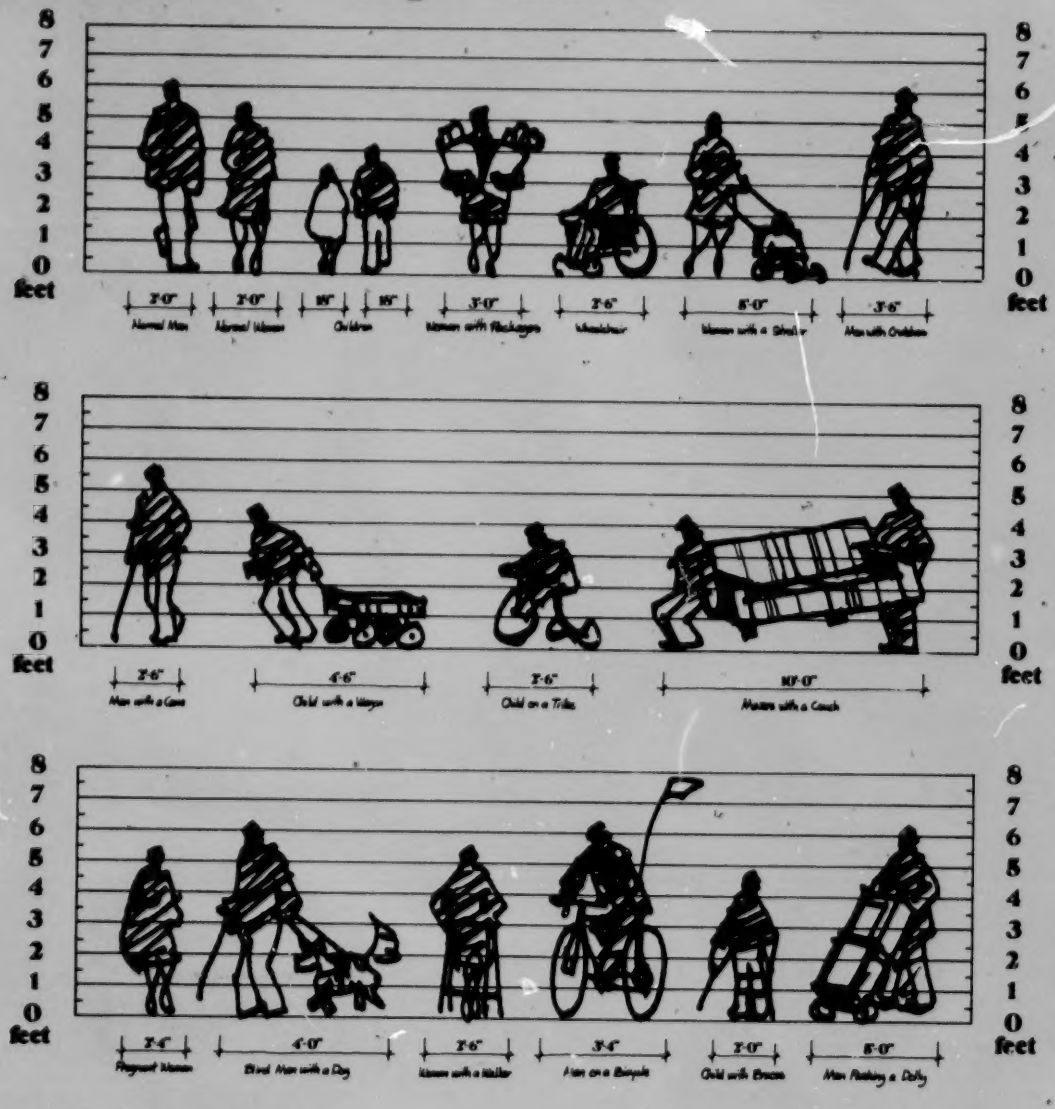
The adoption and implementation of this policy requires the mobilization of the resources of the private and public sectors to integrate handicapped people into their communities."

To be successful, the design and construction of site elements should be effected in such a way as to make all people using them feel normal and inconspicuous. Site elements should never accentuate a disability or bring unnecessary attention to a disabled person. With the new awareness that is coming about concerning the physically handicapped along with related legislation, the opportunities for better education, employment, and general social acceptance are increasing all the time.

The achievement of these goals has only just begun. Continued efforts must be made by many individuals and groups in affecting a national commitment to removing existing and future barriers in our environment. We need to create a general public awareness of the barriers that are being created against those with both temporary and permanent handicaps. We need to research and assemble appropriate dimensional standards and guidelines to give tactile direction to remedial actions which should be considered. These guidelines must be supported by statistics on populations, remedies, and cost/benefit expectations. The application of this resource of data can then be drafted into our legislation at both the state and federal level to present a coordinated effort which is truly sympathetic to the needs of all of our people.

Basic Human Considerations

Dimensions for People Outdoors



People in the Environment

Unfortunately, too many of the public spaces in our nation have been designed based on criteria appropriate only to the non-handicapped portion of our population. Far from being a true representation of the human norm, our people, instead, are represented by a changing series of sizes, and requirements determined by both fate and specific circumstances of the moment. Years before, all adults were children, less than three feet tall, completely unable to accomplish many of the functions that are easily performed in later years. Even if a healthy person is fortunate enough to reach his elderly years without contracting a disabling disease or suffering a traumatic injury, he will most certainly experience the physical limitations brought about by the natural degeneration of his body. During the years the person is considered to be in their "prime", there is a continual occurrence of situations in which they are "handicapped" performing common everyday functions. Trying to open a door with an armload of groceries, moving an over-stuffed chair through a doorway, or trying to navigate a flight of stairs with a baby stroller are typical situations in which we all begin to understand, for a moment, the frustration which those with permanent disabilities face their entire life.

This report, therefore, is intended to present specific dimensional requirements and recommendations for designing our exterior spaces, both public and private, so that they might be completely accessible and usable by our whole population. It should be pointed out, however, that the data contained herein, has been gathered and condensed from a myriad of reports by others. While the dimensions have been determined by methods other than our own anatomical research, the information presented is felt to be a worthwhile contribution to this subject if it can serve to collect and synthesize the varying and sometimes contradictory recommendations published by the wide number of sources we referenced in gathering the raw material for this report. We have, therefore, selected those specific dimensions which in our opinion best represent the collective average of

the recommendations of the many publications we reviewed. Accordingly they should be received with the understanding that the dimensions should not be viewed as finite or absolute but rather, as general guidelines which represent a sort of current "state of the art" among those publishing recommendations for the handicapped at the time of this writing.

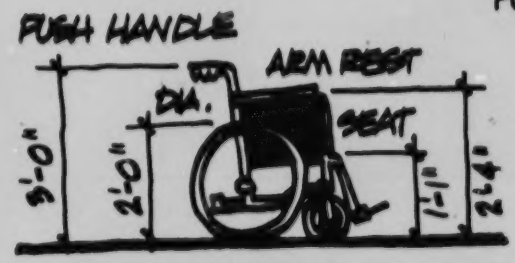
General Space Restrictions

In most instances designing a space that will accommodate wheelchairs insures that it will also be large enough not to be restrictive for other people using it. However, it should be borne in mind that spaces designed to allow for wheelchairs may be awkwardly large for certain semi-ambulant disabled persons who depend on narrow doorways, railings, and hallways for support. However, for practical reasons, the space restrictions shown here reflect basic wheelchair criteria.

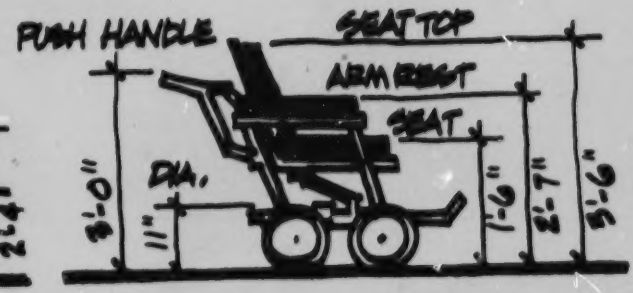
1. **Wheelchair Dimension:**
   a. For design purposes, there are basically two types of wheelchairs differentiated mainly by the use to which they are put. They shall be referred to as small and large chairs.

      1. **Small Chairs:**
         The most commonly used wheelchair is the self-propelled model with the drive wheels either at the back or the front. The model with the drive wheels located at the back of the chair is very useful to people with strong upper limbs. This chair is superior in maneuverability compared to the front-wheel driven chair. Its center of gravity allows it to be piloted down steps, and up and down curbs, although it takes a powerful individual to perform such operations. It should be noted that attendants who push chairs prefer a rear-wheel driven model since, due to its better balance, it

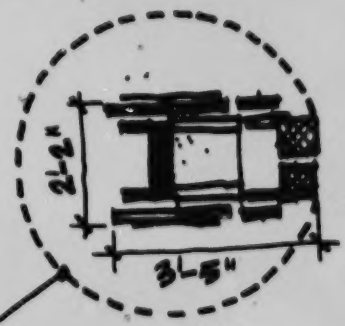
Dimensions & Turning Requirements



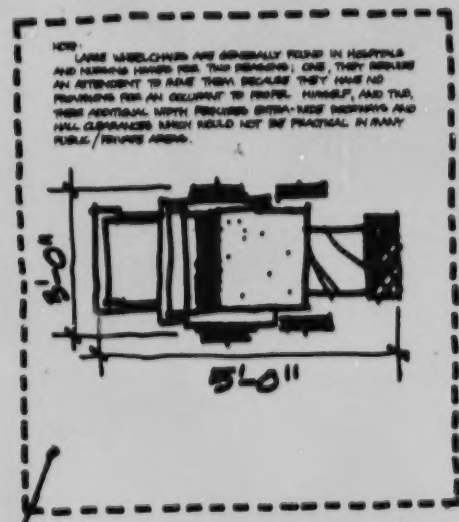
Small Chairs



Large Chairs



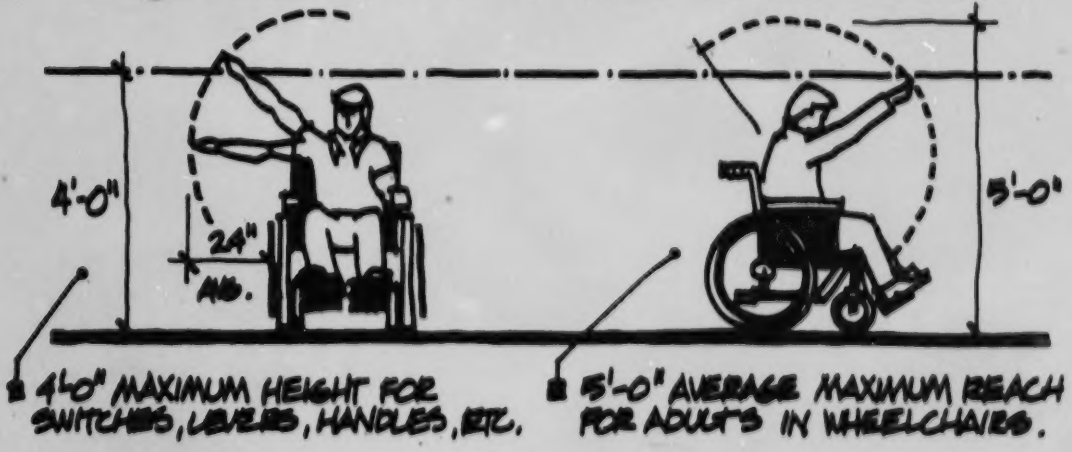
SMALL CHAIRS REQUIRE A CIRCLE WITH A MIN. DIAMETER OF 64" TO MAKE A PIVOT TURN.



LARGE CHAIRS REQUIRE RECTANGULAR SPACE APPROXIMATELY 7'-0" x 8'-0" FOR 3 PT. TURN.

Recommended Widths for Straight-Line Travel

Average Reach Limits for Adults in Wheelchairs



is much easier to push up over obstacles such as curbs or stairs than the front-wheel propelled mode.
The front-wheel driven model is easier to operate for people who are weak in the arms, but it is extremely difficult to use in climbing obstacles such as curbs. These chairs are especially useful in homes where their shorter effective turning radius and wider front wheels make them both more maneuverable and less resistant to carpeting than rear-wheel driven chairs.

2. **Large Chairs:**
These wheelchairs are primarily used by people who are unable to propel a small chair. They are, as the name implies, larger in respect to length, height and width, and lack the large drive wheels of the smaller chairs.

b. **General Dimensions:**
General dimensions are given for both small and large chairs. Since so many different models exist, the sizes shown at right are representative of the larger chairs of the two groups.

c. **Straight Line Travel:**
The minimum space requirements for straight line travel for both large and small chairs are shown at left. These dimensions are for both enclosed and open walkways.

d. **Turning Radii:**
1. Small chairs with rear propelling wheels can spin on a center axis for a full 360 degrees in a circular space 5'-4" in diameter. Although front propelled wheelchairs require somewhat less space in which to turn, their use in the exterior environment is so limited that they need not be considered for design purposes.
2. Large chairs are not able to execute the same type of spin maneuver as is possible with small chairs. To make a 180 degree turn, a three point turn is neces-

sary. The minimum of space to accomplish this forms a rectangle approximately 8'-0" by 7'-0".

e. **90 Degree Turns from Straight-Line Travel:**
   1. Small chairs require a minimum space width of 3'-0" from which to turn into a space 32" wide.
   2. Large chairs require a space width of 5'-0" from which to turn into a space 32" wide.

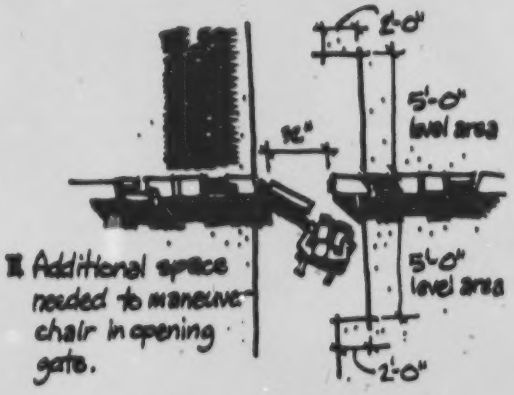
f. **90 Degree Turns Through Doors Or Openings:**
   1. For small chairs, passage through an opening in a wall 32" wide requires that there be no obstacles within 3'-0" of the opening. As the opening width increases, the minimum obstacle distance lessens. (See chart at right)
   2. For large chairs, access through doors or openings in walls 32" wide requires that there be no obstacles within 4'-3". As with small chairs, the obstacle may be somewhat closer to the opening as the door width increases.

g. **Doors or Gates Occurring At The Ends Of Narrow Passages:**
   1. The prime design criteria here is the small chair since it is important that independent chairbound persons be able to reach and operate gates or doors without restriction.
   2. There should be a minimum of 1'-3" of space (preferably 2'-0") between the opening edge of a gate or door and nearest perpendicular restriction.

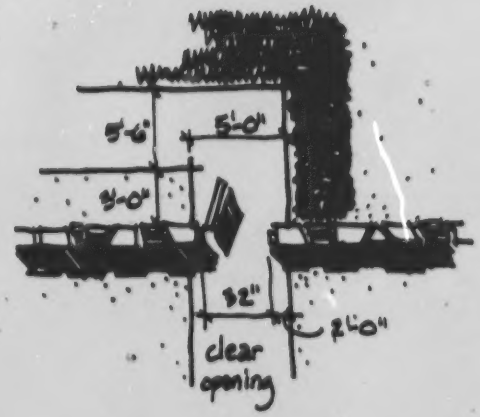
h. **Miscellaneous Design Situations:**
In addition to the most commonly used dimensions previously mentioned, infinite design situations exist that may be restrictive to people either pushing or riding in wheelchairs, or to people pushing other wheeled devices such as strollers or dollies. A number of situations have been diagrammed to increase the designer's awareness of the many restrictive space combinations that comprehensive design solutions must accommodate.

Gate/Doorway Clearances

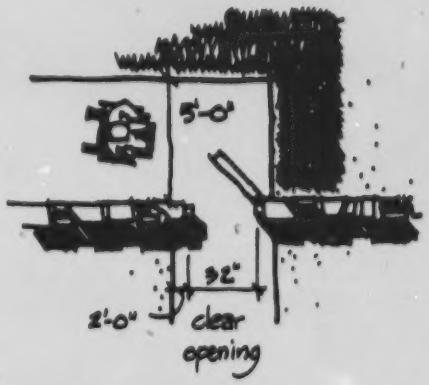
NOTE: All dimensions for both gateways and doorways.



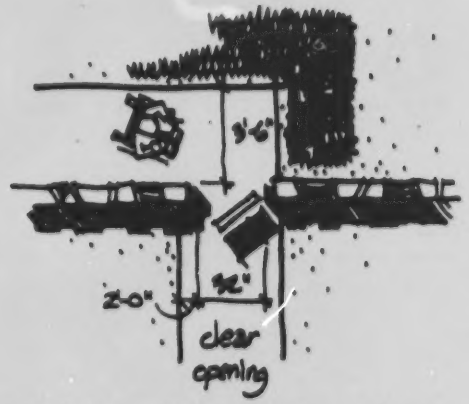
1. Walk Continues Straight



2. Walk Turns With Gate Swing



3. Walk Turns Opposite Gate Swing



4. Walk Turns/Gate Swings Away

General Site Accessibility

WAITING AREAS:
PREFERABLY LOCATED WITHIN 300' OF BUILDING ENTIET; AREA LOCATED BETWEEN ROADWAY AND SIDEWALK TO AVOID TRAFFIC CONGESTION; AN OVERHEAD SHELTER IS RECOMMENDED FOR PROTECTION FROM WEATHER; ADEQUATE SEATING AND LIGHTING SHOULD ALSO BE PROVIDED.

SIGNAGE:
SHOULD BE PROVIDED TO DIRECT PEDESTRIANS TO VARIOUS DESTINATIONS OR AREAS OF THE SITE.

SITE ENTRANCE:
WELL IDENTIFIED; OBVIOUS RELATIONSHIP TO BUILDING AND SITE IT SERVES; SIGNAGE TO DIRECT VEHICULAR AND PEDESTRIAN TRAFFIC TO DESTINATIONS ON THE SITE.

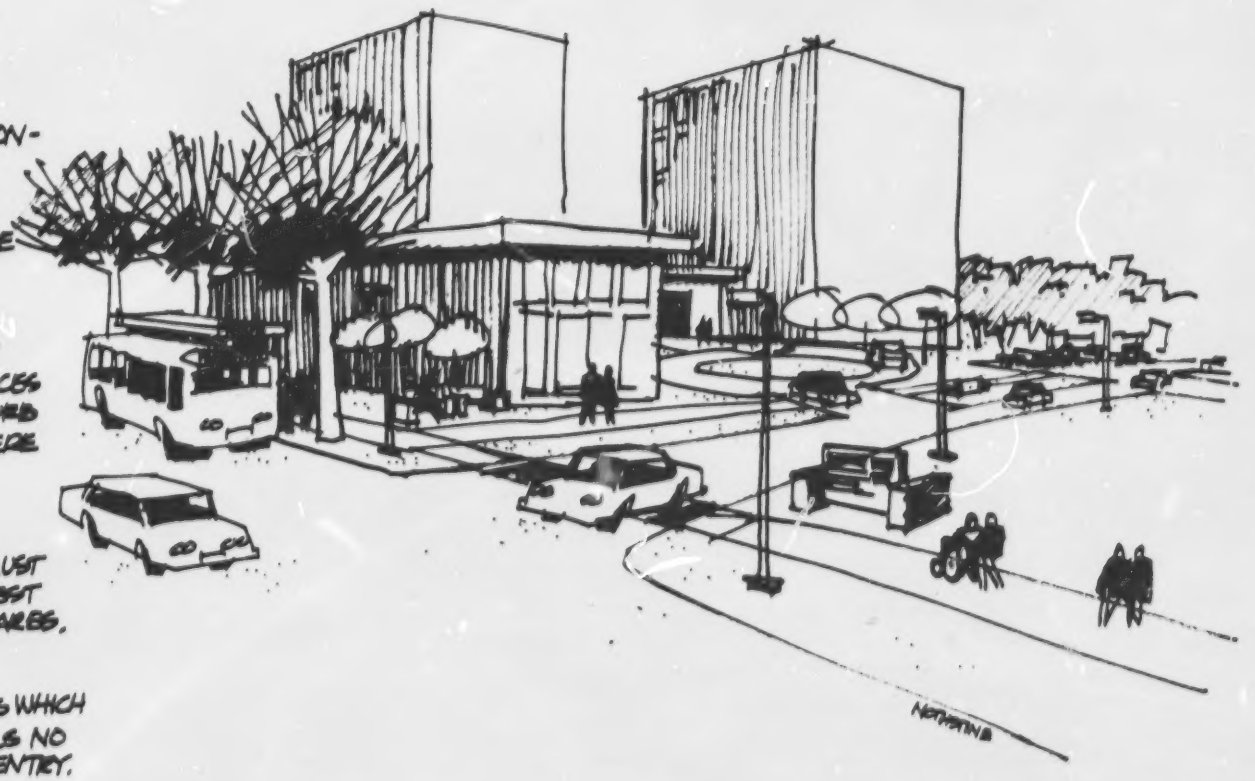
WALKWAYS:
SHOULD PROVIDE CLEAR, DIRECT ROUTE THROUGHOUT SITE; SURFACES SHOULD BE FIRM AND LEVEL; CURB CUTS AND RAMPS PROVIDED WHERE NECESSARY.

REST AREAS:
PROVIDED WHERE PEDESTRIANS MUST WALK LONG DISTANCES; KEEP REST AREAS OFF WALKWAY THOROUGHFARES.

PARKING
RELATED DIRECTLY TO BUILDINGS WHICH THEY SERVE; 'HANDICAPPED' STALLS NO MORE THAN 100' FROM BUILDING ENTRY.

DROP-OFF ZONES:
LOCATED AS CLOSE TO BUILDING ENTRY AS POSSIBLE; NO GRADE CHANGE BETWEEN ROAD SURFACE AND ADJACENT WALKWAY. DIRECT VEHICULAR CONNECTIONS BETWEEN DROP-OFF, SITE ENTRANCE, AND PARKING AREAS; SIGNAGE SHOULD BE PROVIDED TO DIRECT BOTH VEHICLES AND PEDESTRIANS TO DESTINATIONS ON THE SITE.

BUILDING ENTRY:
CLEARLY IDENTIFIED; ALTERNATIVE MEANS OF ENTRY PROVIDED FOR HANDICAPPED INDIVIDUALS (I.E. BOTH RAMPS AND STAIRS); PUBLIC FACILITIES LOCATED IMMEDIATELY OFF OF ENTRY IN LOBBY (LAVATORIES, PHONES, DRINKING FOUNTAINS, ETC.); NO GRADE CHANGES BETWEEN ENTRANCE AND FACILITIES.



Relating Site Components

Barrier-free site design is not some simplistic goal that can be achieved through the thoughtful handling of one or two problem areas on a site. The accessibility of any public or private outdoor area hinges on the physical relationships between design elements both inside and outside of the space. Unless there is a relationship of continuous accessibility between forms of transportation, site elements, and building entries, the value in making any one of these components more accessible is lost. Consequently, it is imperative that **all** elements of circulation be made as easily accessible as possible.

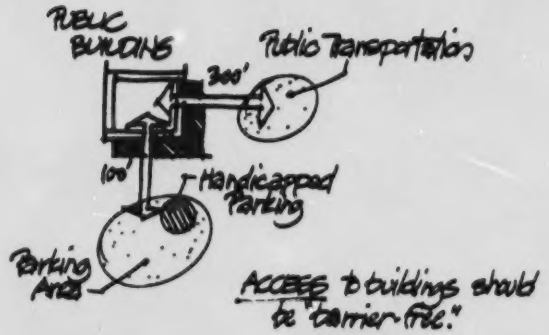
The following items should be considered to insure a good interface between transportation, site, and building entry elements.

1. Special transportation facilities should be provided for people who are restricted in their use of the exterior environment. Care should be taken to separate varying types of transportation where practical, since their point of intersection is usually confusing, dangerous, and delaying. Vehicular traffic should be separated as much as possible from bicycle traffic, and both should be held apart from pedestrian traffic.

2. In general, access to transportation facilities, through the site, and to buildings should be smooth and free of barriers which may prove impossible for physically restricted people to negotiate. Paving surfaces should be hard and relatively smooth, curbs should have ramped cuts, walks should be sufficiently wide to accommodate two-way traffic, and entrance walks to buildings should slope gently to the platform before the doors. If situations are present in which stairs are normally required, then at least one major entrance should be served by a ramp as well.

3. Doors into public buildings should preferably be activated by automatic opening devices. When these items are prohibited by costs, horizontal levers or through bars should be installed on the doors.

4. Public conveniences such as restroom facilities, drinking fountains, telephones, elevators, and waiting areas, should be well organized and located in close proximity to building entrances. This allows people with physical limitations to gain access to necessary facilities with a minimal amount of hardship or embarrassment.



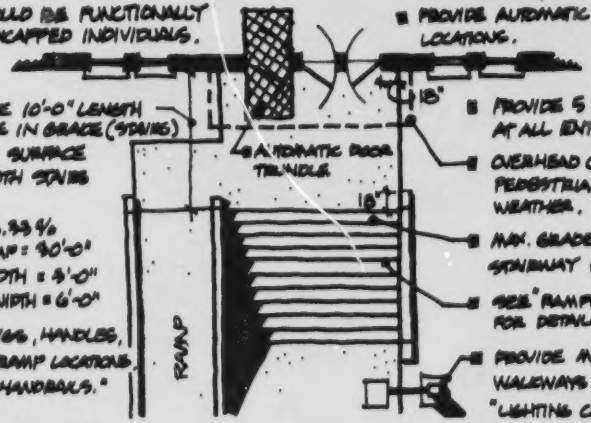
Doorways & Entrances

PUBLIC LOBBIES SHOULD CONTAIN THE FOLLOWING ITEMS IN AREAS ACCESSIBLE TO THE HANDICAPPED AS CLOSE TO DOORWAYS AS POSSIBLE*:

- PUBLIC TELEPHONES
- REST ROOM FACILITIES
- DRINKING FOUNTAINS
- WAITING AREA WITH APPROPRIATE SEATING
- INFORMATION AND DIRECTIONAL SIGNAGE
- ELEVATORS, ESCALATORS, ETC.

*NOTE: ALL FACILITIES SHOULD BE FUNCTIONALLY USEABLE BY HANDICAPPED INDIVIDUALS.

- ENTRANCE PLAZAS REQUIRE 10'-0" LENGTH FROM DOORWAY TO CHANGE IN GRADE (STAIRS)
- PROVIDE 5'-0" MIN. CLEAR SURFACE AT ALL LANDINGS FOR BOTH STAIRS AND RAMPS.
- RAMPS: MAX. % SLOPE = 8.33 %
  MAX. LENGTH/RAMP = 30'-0"
  MIN. ONEWAY WIDTH = 4'-0"
  MIN. TWO-WAY WIDTH = 6'-0"
- PROVIDE ADEQUATE RAILINGS, HANDLES, CURBS, AT ALL STAIR AND RAMP LOCATIONS. SEE "STAIRS, RAMPS, AND HANDRAILS."
- PROVIDE SIGNAGE SHOWING POINTS OF ACCESS FOR HANDICAPPED PEOPLE.



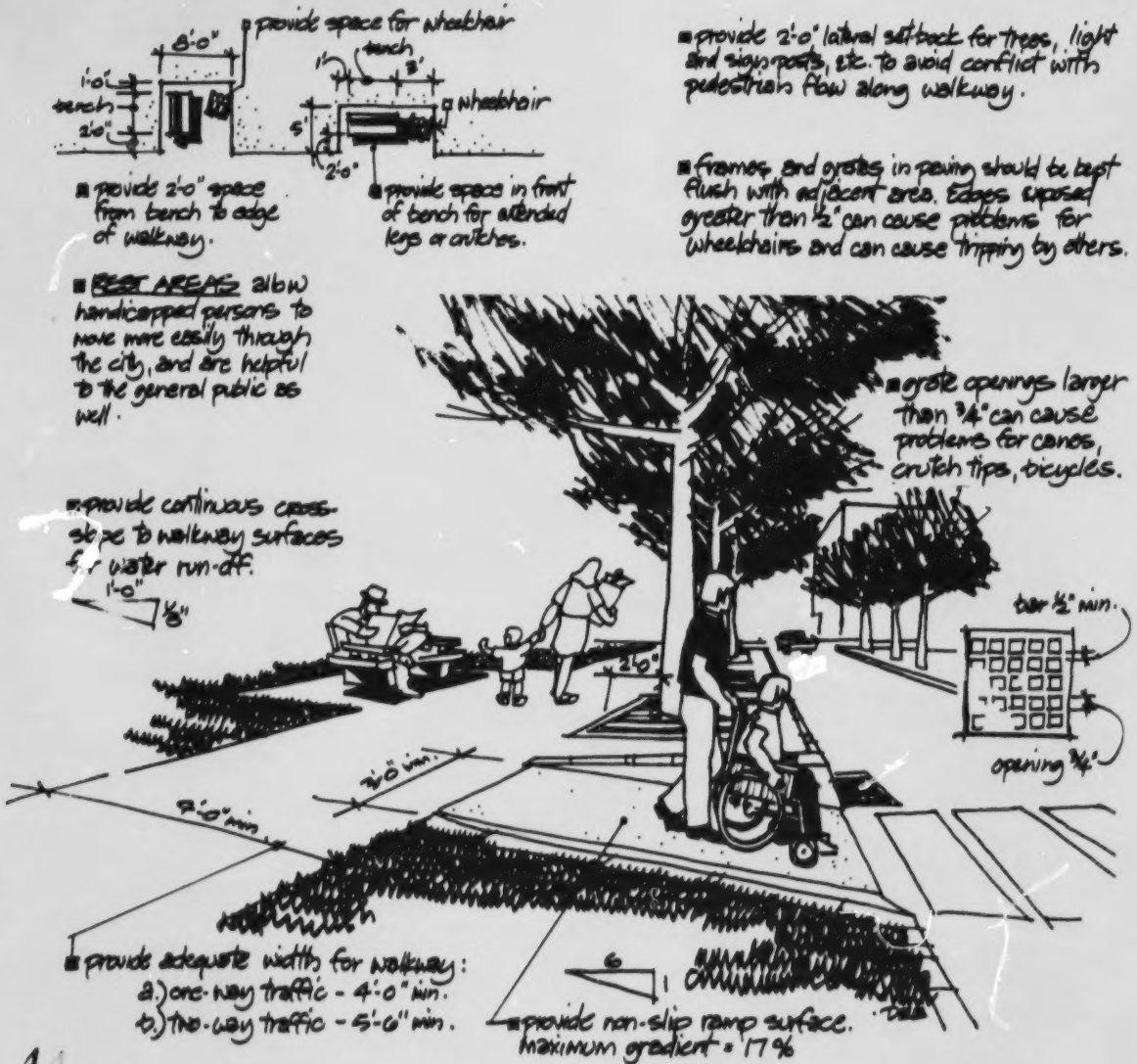
Doorways at Entrances

- MIN. 32" CLEAR OPENING.
- NO GRADE CHANGE AT THRESHOLD.
- HORIZONTAL THROW-BARS ARE RECOMMENDED OVER KNOBS, LATCHES, VERTICAL HANDLES, ETC.
- RECOMMENDED FORCE REQUIRED TO OPEN IS 5 lbs. TO 8 lbs.
- PROVIDE 18" SET BACK FROM NEAREST OBSTACLE (WALL, EDGE OF PAVEMENT, ETC.) SEE "GATES & DOORWAYS."
- PROVIDE AUTOMATIC DOOR AT HEAVILY USED LOCATIONS.

- PROVIDE 5 FOOTCANDLES LIGHTING AT ALL ENTRANCES.
- OVERHEAD CANOPY PROTECTS PEDESTRIANS DURING INCLEMENT WEATHER.
- MAX. GRADE CHANGE BETWEEN STAIRWAY LANDINGS = 6'-0"
- SEE "RAMPS, STAIRS, AND HANDRAILS," FOR DETAILS OF TREADS AND RISERS.
- PROVIDE MIN. 5 FOOTCANDLES OF ALL WALKWAYS, RAMPS, STAIRWAYS, SEE "LIGHTING CONSIDERATIONS.

Walks and Intersections

General Dimensions


provide space for wheelchair
8'-0"
bench
1'-0"
bench
2'-0"
3'
5'
2'-0"
wheelchair
provide 2'-0" space from bench to edge of walkway.
provide space in front of bench for extended legs or crutches.
provide 2'-0" lateral set-back for trees, light and sign posts, etc. to avoid conflict with pedestrian flow along walkway.
frames and grates in paving should be kept flush with adjacent area. Edges exposed greater than ½" can cause problems for wheelchairs and can cause tripping by others.
REST AREAS allow handicapped persons to move more easily through the city, and are helpful to the general public as well.
grate openings larger than ¾" can cause problems for canes, crutch tips, bicycles.
provide continuous cross-slope to walkway surfaces for water run-off.
1'-0"
⅛"
bar ½" min.
2'-0"
opening ¾"
2'-0" min.
2'-0" min.
provide adequate widths for walkway:
a.) one-way traffic - 4'-0" min.
b.) two-way traffic - 5'-6" min.
6
1
provide non-slip ramp surface. maximum gradient = 17%

Walks

Walks should be designed to allow the greatest diversity of people to move safely, independently, and unhindered through the exterior environment.

Items to consider in the design or modification of walk systems are:

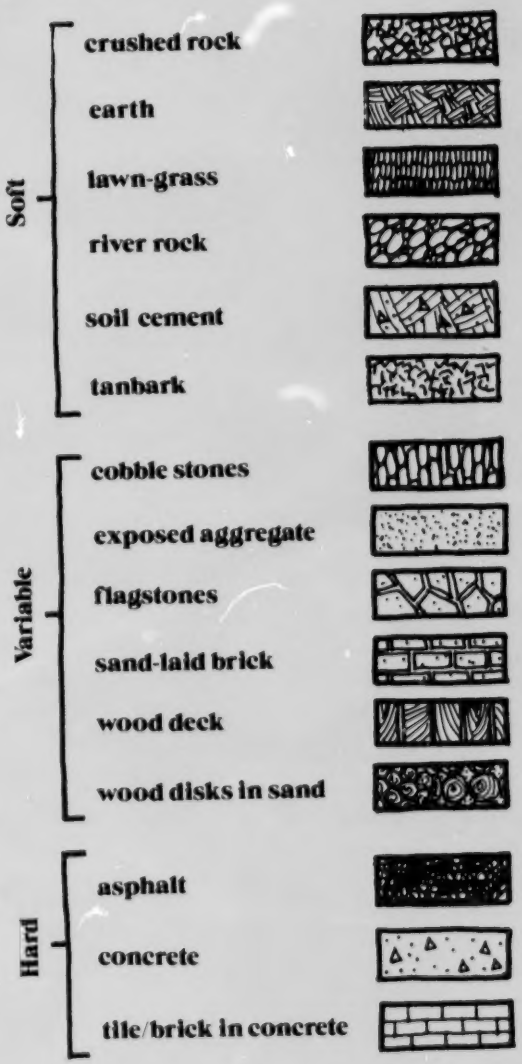
1. **Surfaces**
   The surface or walks should possess stability and firmness, be relatively smooth in texture, and have a non-slip surface. The use of expansion and contraction joints should be minimized, and their size should be as small as possible, preferably under 1/2" in width. (The chart at the right shows some different types and characteristics of materials when used as walkway surfaces).
2. **Rest Areas:**
   Occasional rest areas off the traveled path are enjoyable and helpful for all pedestrians, and especially for those with handicaps that make walking long distances exhausting.
3. **Gradients:**
   Pedestrian paths with gradients under 5% are considered walks. Walks with gradients in excess of 5% are considered ramps and have special design requirements. (Also see "Ramps") Routes with gradients up to 5% can be negotiated independently by the average wheelchair user, but sustained grades of 4% and 5% should have short (5'-0") level areas approximately every 100'-0" to allow a chair-bound person using the walk to stop and rest. Gradients up to 3% are preferable where their use is practical.
4. **Lighting:**
   Lighting along walkways should vary from ½ to 5 ft. candles, depending on the intensity of pedestrian use, hazards present, and relative need for personal safety. (see "lighting considerations.")
5. **Maintenance**
   Proper maintenance of walks is imperative. Where they are deteriorating, repairs should be made to eliminate any conditions that may cause injury.

6. **Curb Ramps:**
   Changes in grade from street to sidewalk and from sidewalk to building entrances create most problems for people with physical handicaps. To facilitate movement over low barriers, a curb ramp should be installed. Surfaces should be non-slip, but not currugated as the grooves may fill with water, freeze, and cause the ramp to become slippery.
7. **Drainage Structures:**
   Improperly designed, constructed, or installed drainage structures may be hazardous to people who must move over them. They should be placed flush with the surface on which they occur and grates having narrow parallel bars or patterns with openings larger than 3/4" should not be used. Grates should likewise be kept clean so as not to lessen the efficiency of the overall storm system. Obviously, a surface build-up of water, especially in the winter, may present a hazard. For this reason, drainage structures should not be located between a curb ramp and the corner of a street or immediately downgrade from a curb ramp.
8. **Dimensions:**
   Walkway widths vary according to the amount and type of traffic using them. Walks should be a minimum of 4'-0" wide, with 5'-6" (6'-0" preferred) being the minimum width for moderate 2-way traffic.
9. **Wheel Stops:**
   Wheel Stops are necessary where wheeled vehicles may roll into a hazardous area. They should be 2" to 3" high, 6" wide, and should have breaks in them every 5'-0" to 10'-0" to allow for water drainage off of the walk.

Curbing

Curbing is a commonly specified element on most sites, and is in turn one of the most neglected items in regard to the physical barriers it creates. The problem is twofold; stemming from the attitude of most designers that 6"

Surfaces for Walkways



Comments

Soft Surface Characteristics

- IRREGULAR AND SOFT SURFACES MAKE WALKING EXTREMELY DIFFICULT FOR PEOPLE WITH MOBILITY HANDICAPS.
- POOR SURFACES FOR WHEELCHAIRS AND OTHER SMALL-WHEELED VEHICLES.
- THE BLIND HAVE DIFFICULTY WITH ORIENTATION.
- SURFACES ARE SUSCEPTIBLE TO EROSION.
- SURFACES WILL WITHSTAND ONLY LIGHT TRAFFIC.
- SURFACES ARE USEFUL FOR AREAS WHERE LIGHT PEDESTRIAN TRAFFIC WILL NEED A MODERATELY FIRM SURFACE, I.E. RECREATION AREAS, FARMS, NATURE AREAS, ETC.
- HIGH MAINTENANCE REQUIREMENTS, LOW INSTALLATION COSTS.

Variable Surface Characteristics

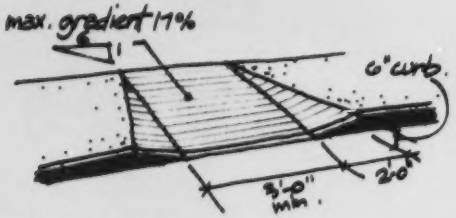
- IRREGULAR SURFACES AND WIDE JOINTS MAKE WALKING EXTREMELY DIFFICULT FOR PEOPLE WITH MOBILITY HANDICAPS.
- JOINTS EASILY TRAP CRUTCH AND CANE TIPS, HEELS, NARROW WHEELS; JOINTS SHOULD BE FILLED AND NO WIDER THAN ½".
- IRREGULAR SURFACES MAKE MOVEMENT DIFFICULT FOR WHEELCHAIRS AND OTHER SMALL-WHEELED VEHICLES.
- ICE AND SNOW CAN BE A PROBLEM BY DAMAGING THE SURFACE OR BEING DIFFICULT TO REMOVE.
- MODERATE MAINTENANCE REQUIREMENTS, MODERATE TO HIGH INSTALLATION COSTS.

Hard Surface Characteristics

- FIRM AND REGULAR SURFACES FOR WALKING AND MOVING WHEELED VEHICLES.
- JOINTS ARE KEPT TO A MINIMUM, LESS THAN ½" WIDE AND FILLED.
- ICE AND SNOW REMOVAL POSSIBLE WITHOUT EXTENSIVE DAMAGE TO SURFACES.
- HIGH INSTALLATION COSTS, LOWEST MAINTENANCE COSTS.

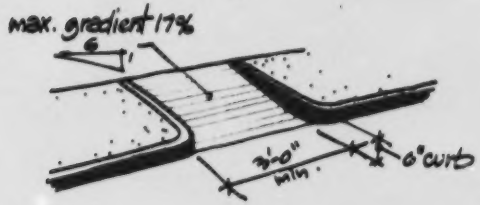
Curb Ramps

■ avoid "lip" greater than ½" wherever ramp meets adjacent paving at top or bottom.



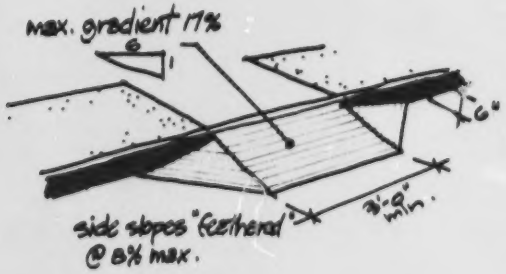
1. Flared Ramp

■ corrugated lines in ramps should be avoided since they can hold water in freezing weather and become icy.



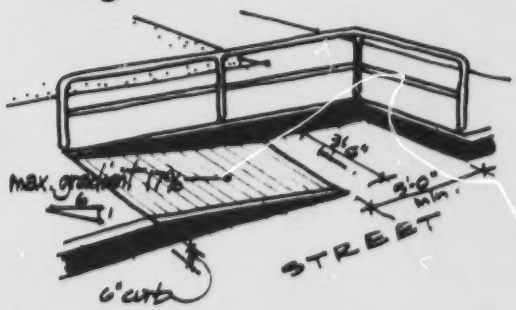
2. Ramp With Continuous Curb

■ use of this type often interferes with curb-side storm drainage & snow plowing.



3. Extended Ramp

■ locate handrail to avoid conflict with adjacent pedestrian walkway.



4. Parallel Ramp

concrete curbs are simply an unavoidable necessity, and from municipalities who further aggravate the problem by writing in curbing clauses to building ordinances for no other reason than that it has always been a past requirement. While this section by no means advocates the retraction of municipal curbing requirements, it does seem that viable alternatives should be allowed where they would reduce potential barriers and hazards while still satisfying existing requirements.

When specifying the use of conventional curbing, the designer should be aware of the following items:

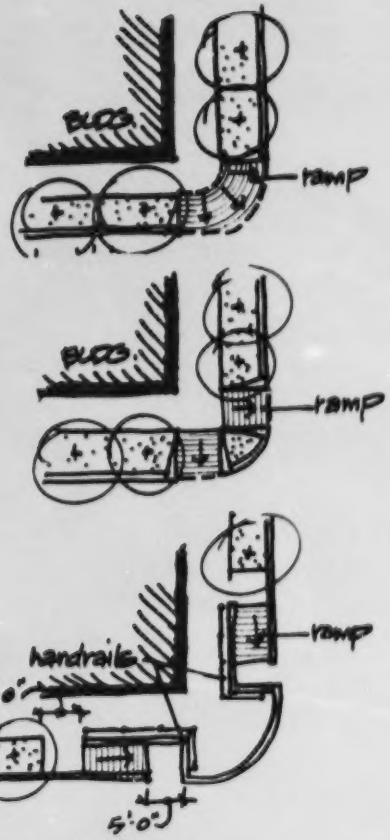
1. Curbing should not create any unnecessary barriers to physically handicapped individuals. Where barriers have been created, previously laid curbs should either be removed or ramped.
2. Curbing, if necessary, should never be higher than the maximum height of one step; 6½". This is particularly important where there is any pedestrian traffic crossing over, or vehicles parking adjacent to the curb.
3. "Double" or "stepped" curbs are difficult for the handicapped to negotiate, and in darkness are hazardous to all pedestrians. Their use should be limited, if not restricted.

Intersections

Any discussion on walkways would be incomplete without some mention of intersections and the potential hazards they can cause for handicapped people moving through the environment. Essentially, there are three items pertaining to intersections about which the designer should be concerned: (1) Vehicular and Pedestrian Warning Systems; (2) Pedestrian Crosswalks; (3) Directional and Informative Signage.

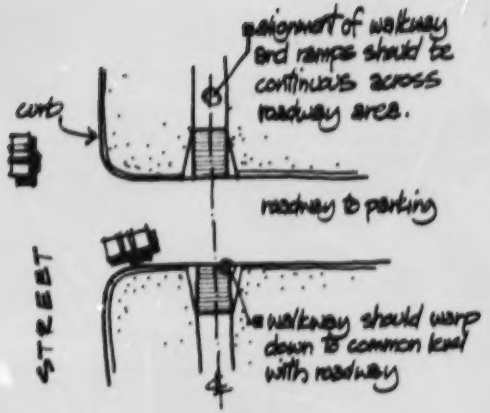
1. **Warning Systems:**
   a. Where there is a great deal of vehicular and

Curb Ramps

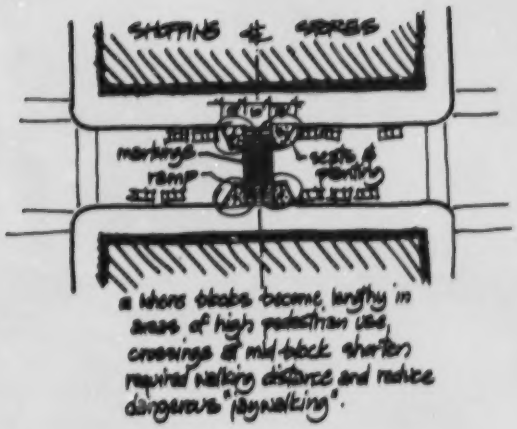


▪ wherever possible, curb ramps should occur as a natural extension of the alignment of the walkway.

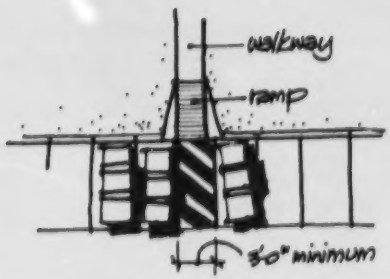
Curb Ramps at Corners


alignment of walkway and ramps should be continuous across roadway area.
curb
roadway to parking
STREET
▪ walkway should warp down to common level with roadway

Alignment of Ramps

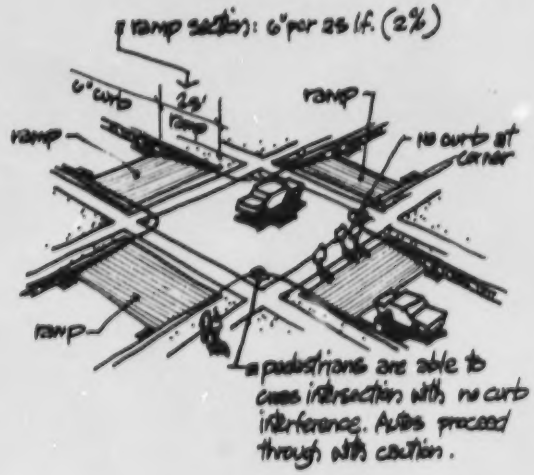

SHOPPING & STORES
marking
ramp
▪ where blocks become lengthy in areas of high pedestrian use, crossings at mid-block shorten required walking distance and reduce dangerous "jaywalking".

Mid-Block Crossings



▪ access to curb cut and walkway must be kept clear of parked cars. Area should be clearly marked for usability.

Access to Ramps



Ramped Intersection

Curb Types

Comments

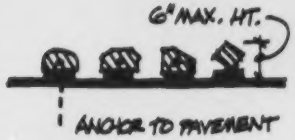
1. Vertical Face Curb

a. HEIGHTS GREATER THAN 6" ARE AWKWARD FOR HANDICAPPED AND OTHERS.
b. REQUIRES CURB CUT RAMP FOR WHEELCHAIR.
c. CONTRASTING COLOR TO ADJACENT PAVEMENT INCREASES VISABILITY.

2. Sloped Face Curb

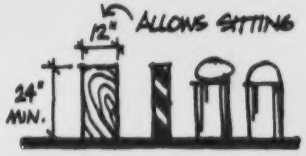
a. HEIGHTS GREATER THAN 6" ARE AWKWARD.
b. PROVIDE CURB RAMP FOR WHEELCHAIRS.
c. SLOPING FACE MAY PRESENT HAZARDOUS SURFACE IF STEPPED UPON.
d. CONTRAST COLOR WITH ADJACENT PAVEMENT.

3. Pre-Made Wheel Stops Stops



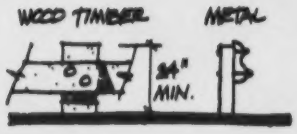
a. STANDARD LENGTH 8'-0".
b. ANCHOR SECURELY TO PAVEMENT TO AVOID MIS-ALIGNMENT.
c. PROVIDE MIN. 32" CLEAR SPACE BETWEEN UNITS FOR WHEELCHAIRS AND OTHERS.
d. CONTRAST COLOR WITH ADJACENT PAVEMENT.

4. Posts and Bollards



a. 2'-0" HT. MIN. FOR VISABILITY FROM APPROACHING VEHICLES.
b. ANCHOR SECURELY TO PAVEMENT TO AVOID MIS-ALIGNMENT.
c. PROVIDE MIN. 32" CLEAR SPACE BETWEEN UNITS FOR WHEELCHAIRS AND OTHERS.
d. CONTRAST COLOR WITH ADJACENT PAVEMENT.

5. Guard Rails



a. PROVIDES MAX. CONTROL OF VEHICLES.
b. 2'-0" HT. MIN. FOR VISABILITY FROM VEHICLES.
c. USEFUL ALONG PERIMETERS OF ROADWAY OR PARKING AREAS.
d. PROVIDE OPENINGS FOR WHEELCHAIRS AND OTHERS WHERE NECESSARY, 32" MIN.

6. Posts and Chains

a. HAZARDOUS IF CHAIN SAGS BELOW 32" OR HIGHER THAN 42"
b. PROVIDE MIN. 32" CLEAR SPACE BETWEEN UNITS WHERE NECESSARY.
c. CONTRAST COLOR WITH ADJACENT PAVEMENT.

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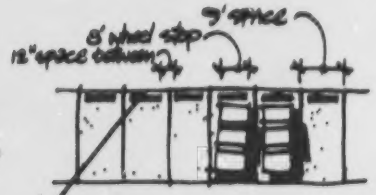
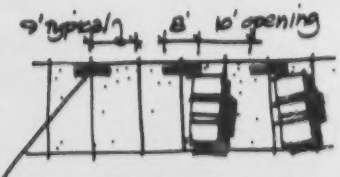
Wheel-Stop and Post Layout

1.



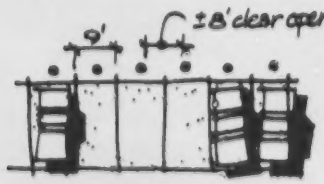
■ alignment of wheel stops in this manner prevents easy access through space between.

2.



■ alignment in this manner allows greater opening between stops and requires ½ as many, however requires parking space delineation.

3.



■ posts or barriers should be located on the center of the parking space to allow pedestrian movements in the aisle between.

pedestrian traffic at intersections, signal lights should be used to assist people in crossing the street.

b. For safety reasons, traffic signals should be designed so that glare from the sun does not interfere with their ability to be seen, nor should they be placed where they are easily confused with the surrounding background.

c. The configuration of the lights should always be arranged with the red to the top, amber in the center, and green at the bottom; this is the only way colorblind people have of determining when it is safe to cross.

d. In addition to the vehicular signal, pedestrian "walk" — "don't walk" signals are helpful. Crossing signs should be placed where they are plainly visible, and if push-buttons are incorporated into the system, they should be located no higher than 3'-6".

e. Plant materials or other obstacles should never be allowed to visually block pedestrian movements from motorists or vehicular movements from pedestrians.

2. **Crosswalks:**

Crosswalks are used to delineate an aisle for pedestrian traffic to use when traveling through an intersection against vehicular traffic.

a. Crosswalks should be constructed so as to be easily seen by motorists.

b. A variety of visual and textural materials can be used for crosswalk delineation.

c. The interior width of a crosswalk should be as wide as the width of the approaching walk.

d. The use of textured warning strips for the blind at crosswalks is not recommended. (See "Signage Considerations, 'Textural Paving'").

3. **Signage:**
Most problems relating to signage at intersections can be attributed to either size or graphic layout. When considering signage to be posted at intersections, the designer should:

a. Make sure locations are easily visible to either motorist or pedestrians; depending on who the sign is intended for.

b. Choose sign sizes relative to specific design situations. This is particularly critical for motorists; when speeds increase, visibility decreases.

c. Whenever possible, use signs that have dark colored backgrounds with light colored letters. Research has proven that this combination is easier to read than dark colored letters on light backgrounds.

■ in areas where people are likely to be carrying bulky items, guardrails posts and curbs should be high enough to be easily seen, otherwise they can be a tripping hazard.

guard rail too low to be easily seen.

Barrier Visability

Ramps, Stairs, and Handrails

Outdoor Ramps

■ PLANT MATERIALS SHOULD BE LOCATED SO THAT SHADOWS DO NOT PREVENT SUN FROM MELTING SNOW AND ICE ON RAMP SURFACES.
■ PROVIDE MIN. AVG. OF 5 FOOTCANDLES LIGHT AT ALL RAMP AND STAIR LOCATIONS.
■ RAMP WIDTHS VARY ACCORDING TO DESIGN SITUATIONS. PREFERRED MINS. ARE:
1 WAY - 3' MIN. WIDTH
2 WAY - 6' MIN. WIDTH
■ MAX. LENGTH 30' BETWEEN LANDINGS
18"
■ MAX. GRADIENT 8.33%
12
1
HORIZONTAL
■ HANDRAILS SHOULD EXTEND A MIN. 18" BEYOND TOP AND BOTTOM OF RAMP.
■ 5'-0" MIN. CLEAR SPACE AT BOTH TOP AND BOTTOM OF RAMP.
■ PROVIDE 2" HIGH CURB AT EDGE OF RAMP SURFACE FOR USE BY SMALL WHEELED VEHICLES OR WHEELCHAIRS AS EMERGENCY WHEEL STOPS.

Outdoor Ramps

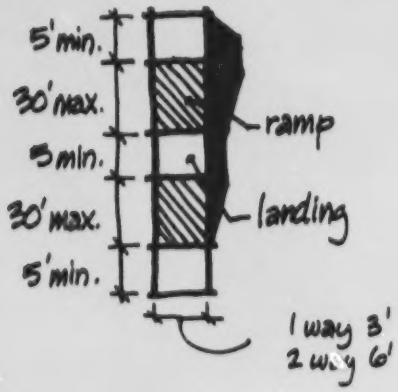
Ramps are alternate routes for people who are not able to use stairs; however, they do not take the place of stairs since certain portions of the population find ramps more difficult to use. Any surface pitched above 5% is considered a ramp.

1. The maximum gradient for a ramp of any extended length should not exceed 1:12 (8.33%), not including curb ramps.
2. The maximum length for a single ramp at 1:12 should not exceed 30'-0". Ramps of lesser grades can, of course, be lengthened.
3. The minimum clear width of any ramp is 3'-0". Where ramps are heavily used by pedestrians and service deliveries, there should be sufficient width to accommodate both, or provisions made for alternate routes.
4. The bottom and top approach to a ramp should be clear and level for a distance of at least 5'-0", allowing for turning maneuvers by strollers, dollies, wheelchairs, etc.
5. A textural signal prior to the ramp, at both top and bottom, may be used to warn the pedestrian of the upcoming obstacle. (See "Signage Considerations, 'Textural Paving'" for details.)
6. Ramps should be designed to carry a minimum live load of 100 lbs. per square foot.
7. Low curbs along the sides of ramps and landings should be provided as surfaces against which wheeled vehicles can turn their wheels in order to stop.
8. Ramps should be illuminated to an average maintained light level which insures their safe use in darkness. It is important that the heel and toe of the ramp be particularly well illuminated.
9. Ramps should be maintained properly to keep them from being hazardous. Debris, snow and ice should be kept off the surface. Handrails should, at all times, be properly secured.

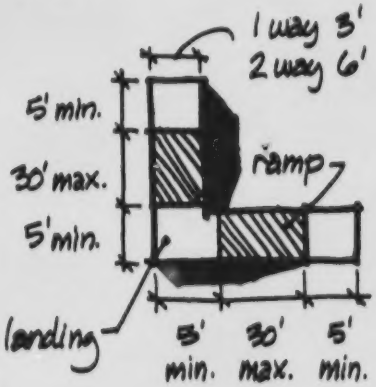
See also "Handrails", "Lighting" and "Signage" sections.

Ramps for Outdoor Use

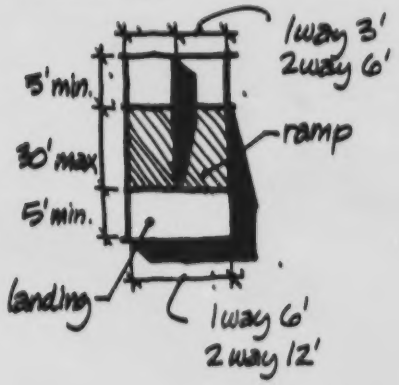
1. Straight-Run



2. Angled Landing

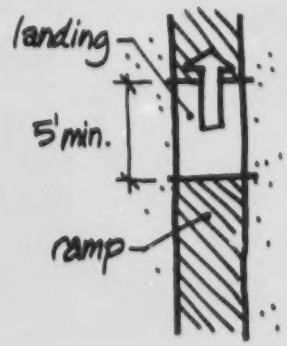


3. Intermediate/Switch-Back Landing

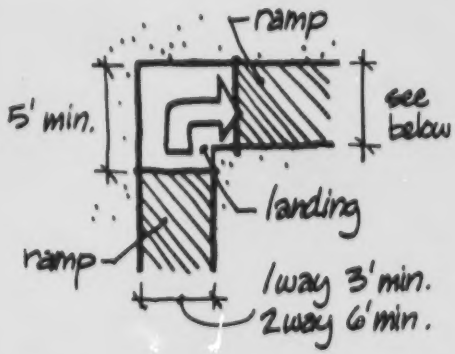


Conditions at Tops & Bases of Ramps

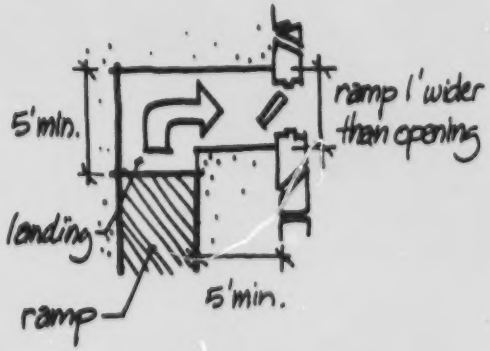
1. Traffic Goes Straight



2. Traffic Turns



3. Traffic Turns to Gate/Doorway



Outdoor Stairways

■ SHADOWS FROM ADJACENT PLANTINGS SHOULD NOT PREVENT THE SUN FROM MELTING ICE AND SNOW.
■ PROVIDE A MINIMUM AVERAGE OF 5 FOOTCANDLES LIGHT AT ALL STAIRWAY LOCATIONS.
■ SURFACE OF ALL TREADS SHOULD BE NON-SLIP AND PITCHED FORWARD AT 1/8" PER FOOT TO DRAIN SURFACE WATER. PROVIDE 3/4" CHAMFER OR 1" ROUNDING TO NOSING OF ALL TREADS.
■ COLOR OF STAIRS SHOULD CONTRAST WITH ADJACENT PAVING.
■ CHEEKWALLS AT SAME GRADE LEVEL AS ADJACENT LAWN ELIMINATES NEED FOR HAND TRIMMING OF GRASS.
■ SEE HANDRAILS FOR ADDITIONAL INFORMATION.
■ STAIRWAYS WIDTHS SHOULD BE DETERMINED BY THE PROJECTED AMOUNT OF PEDESTRIAN TRAFFIC AND THE WIDTHS OF APPROACHING WALKWAYS. PREFERRED MINIMUMS ARE:
1 WAY - 3' MINIMUM WIDTH
2 WAY - 5' MINIMUM WIDTH
■ HANDRAILS SHOULD EXTEND BEYOND THE TOP AND BOTTOM STEP A MINIMUM OF 18"
■ CHEEKWALLS SHOULD EXTEND BENEATH HANDRAILS AN EQUAL DISTANCE.

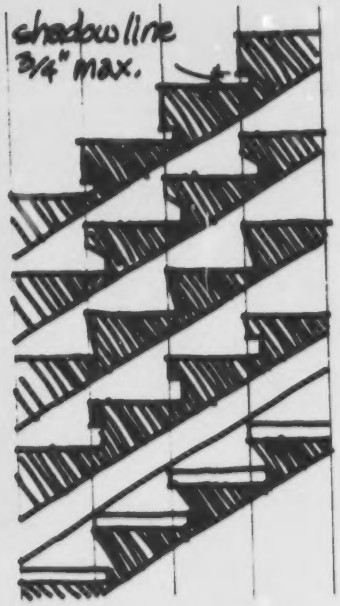
Outdoor Stairs

Stairs should be designed to provide for the minimum amount of energy expenditure, a factor which is particularly important to elderly and semi-ambulant people. They should be wide enough for people to pass one another, be of safe design, and have proper appurtenances to ensure their safe use.

1. The minimum clear width for any stairway should be 3'-0". Where stairs are heavily used, widths should be increased to handle traffic requirements.
2. The maximum rise between landings for external unprotected stairs is 4'-0". Where the stairs are protected, a 6'-0" rise is acceptable. Stairs should not be used where there are only a few in a series. These are dangerous and usually not necessary.
3. All steps in a series should have uniform tread width and riser height.
4. Stair treads should be deep enough to allow a man to place his whole foot on it. The preferred range is between 11" to 14½".
5. Risers for exterior stairs should be between 4" to 6½" in height, with 5¾" being preferred.
6. Nosings should be rounded or chamfered. A 1" rounded nosing is most acceptable. It should be of a color contrasting that of the treads and risers to make identification easier. Abrupt, square nosings provide less frictional resistance and cause tripping.
7. Stairways should have an average maintained light level which insures their safe use in darkness. Light should be cast down toward risers so that the treads will not be in shadow. (For recommended lighting levels see "Lighting" section.)

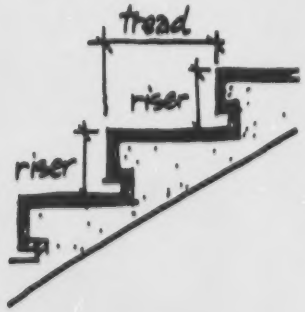
See also, "Handrails", "Lighting", and Signage" sections.

Outdoor Step Types



1. Acceptable if shadow line is kept to minimum.
2. Acceptable if nosing is provided with 45° bevel below.
3. Acceptable
4. Not acceptable; recesses can catch toe of shoes, braces, etc.
5. Open treads not acceptable for same reasons as above.

Outdoor Steps Rules-of-Thumb

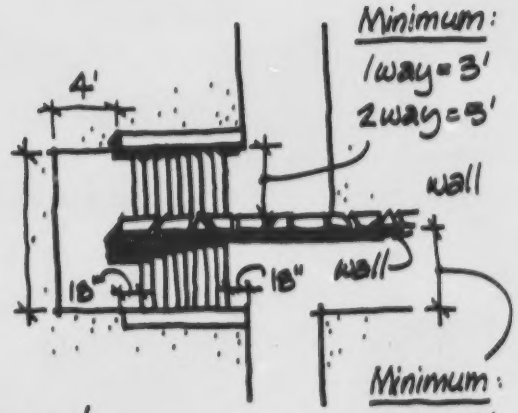


a.) 2 Risers + 1 Tread = 26" to 27"

b.) Max. Riser height = 6½"

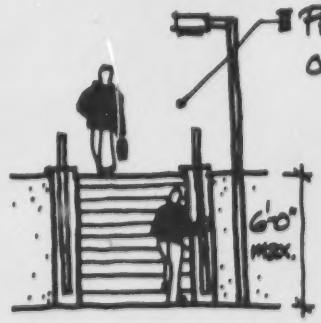
c.) Min. Tread depth = 11"

Outdoor Landings



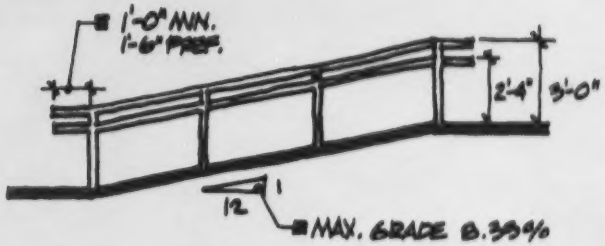
* note: minimums do not include thickness of wall.

Height Between Landings



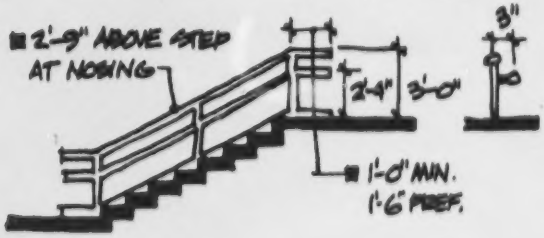
- Provide 5' footcandles lighting on stair and landing areas.
- Where total grade change exceeds 6'-0", intermediate landings are necessary.
- Provide landings at 4'-0" intervals.

Handrails for Ramps



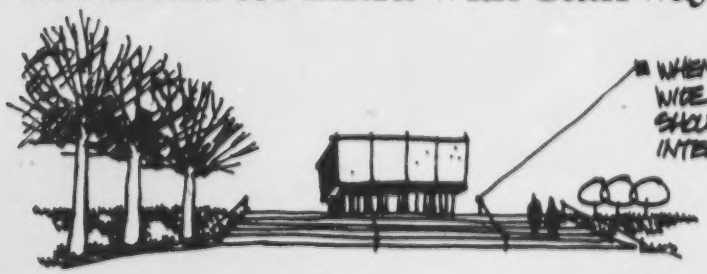
- 3'-0" IS THE MOST COMFORTABLE HT. FOR HANDRAILS ON RAMPS.
- A SECOND HANDRAIL, USEFUL TO PEOPLE IN WHEELCHAIRS AND CHILDREN SHOULD BE PLACED AT 2'-4".
- HANDRAILS SHOULD EXTEND A MIN. 1'-0" BEYOND BOTH ENDS OF A RAMP.

Handrails for Stairways



- 3'-0" IS THE MOST COMFORTABLE HT. FOR RAILINGS AT BOTH ENDS OF STAIRWAYS. 2'-9" IS THE ACCEPTED HT. ON STAIRWAYS.
- A SECOND HANDRAIL, USEFUL TO CHILDREN SHOULD BE PLACED AT 2'-4"
- HANDRAILS SHOULD EXTEND A MIN. OF 1'-0" BEYOND STAIRWAYS.

Handrails for Extra-Wide Stairways



- WHEN STEPS BECOME EXCEPTIONALLY WIDE, INTERMEDIATE HANDRAILS SHOULD BE PROVIDED AT 20'-30' INTERVALS.

Handrails for Outdoor Use

Handrails serve the primary function of providing support for people who are in the process of climbing or descending stairs or ramps; whereas railings are placed more for reasons of preventing people from entering or falling into a dangerous area.

The designer should take into account the following items in regard to handrails and railings:

1. **General:**
   a. Handrails and railings should preferably be round or oval, 1½" to 2" in diameter.
   b. There should be a minimum 3" spacing between handrails and adjacent walls, and wall surfaces should preferably be non-abrasive.
   c. Where handrails or railings are fully recessed into walls, a space of 6" should be allowed between the top of the rail and the top of the recess, and a space of 3" should be allowed between the bottom of the rail and the bottom of the recess.
   d. The ends of handrails should be rounded off or turned into the wall so that they are not hazardous.
   e. Handrails, railings and their appurtenances should be maintained free of slivers, sharp protrusions, etc.
2. **Handrails for Ramps:**
   a. Handrails should be provided on both sides of every ramp. They should extend past the heel and toe, 1'-0" to 1'-6", except in places where the extension in itself presents a hazard.
   b. The vertical dimension from the ramp surface to the top of a single handrail should be between 2'-8" and 3'-0".
   c. A second rail is advantageous to children and wheelchair dependent people. Where two rails are used, the top rail should be placed at 3'-0" to 3'-3", and the lower rail should be placed at 2'-4".

d. Handrails should be continuous across the landings.

e. Handrails should be designed to support 250 lbs. and be kept securely fastened at all times.

3. **Handrails for Stairs:**

a. Handrails should be placed on each side of a stairway and should be 2'-9" vertically from the nose of the treads to the top of the handrail; the distance from the landing surface to the top of the handrail should be 2'-8" to 3'-0".

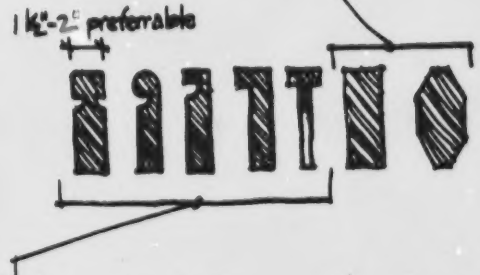
b. Handrails should extend past the tread at top and bottom, a length of 2'-0" to 3'-6" unless the extension in and of itself creates a hazard. The change of direction of the handrail provides a tactile clue to a person about to make the last step. Where the extension of the handrail is of itself a hazard, notches or knurling on the rail may be used to provide the clue.

c. Handrails should be continuous across landings where possible.

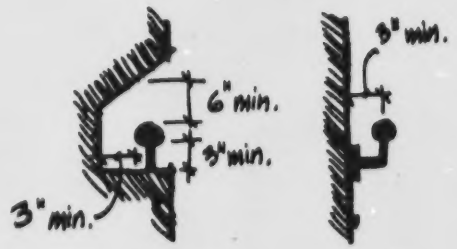
d. Handrails should be designed to support 250 lbs. and should be kept securely fastened at all times.

Handrail Cross-Sections

- Do not allow hands to use natural opposing grip; usually because rail is too wide.



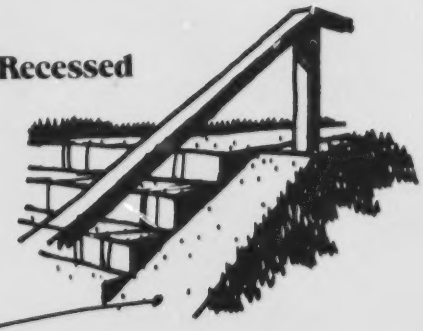
- Allow hands to use natural, opposing grip.



- All edges should be chamfered or rounded off, also keep wall surfaces smooth to limit cuts and scrapes.

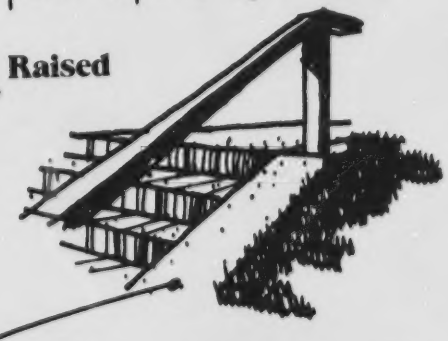
Cheek-Walls

1. Recessed



- Recessed cheek walls allow stairs to drain freely or be swept clean of debris or snow; can be hazardous if person steps off edge of stairs.

2. Raised

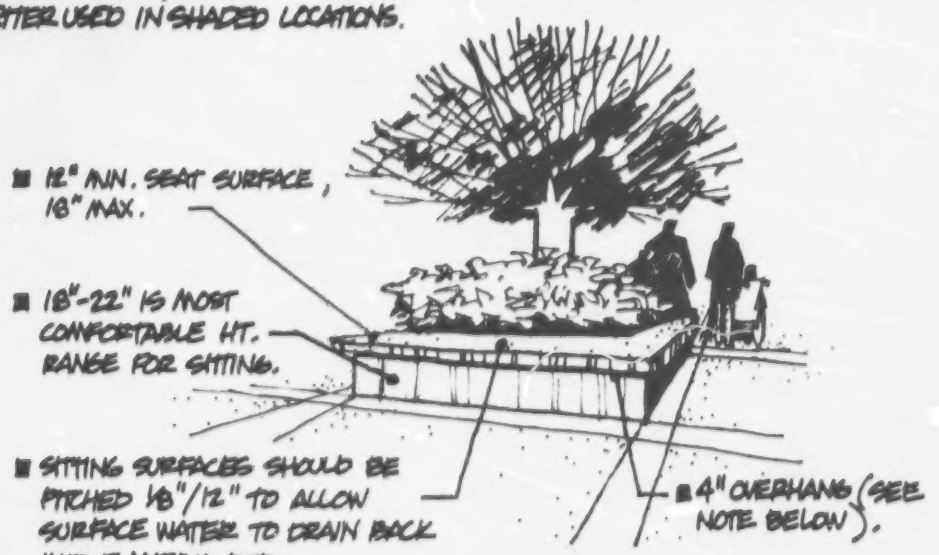


- Raised cheekwalls provide safety from stepping off stair edge, but tend to collect snow and debris.

Walls, Gates, Fences, and Railings

Walls as Seating Surfaces

- DULL AND LIGHT COLORED MATERIALS ARE GENERALLY COOLER SURFACES TO SIT ON WHEN IN DIRECT SUNLIGHT. DARK AND SHINY SURFACES TEND TO BECOME UNCOMFORTABLY HOT WHEN IN DIRECT SUNLIGHT, AND CONSEQUENTLY ARE BETTER USED IN SHADED LOCATIONS.
- VEGETATION NEAR SITTING AREAS SHOULD NOT CONFLICT WITH PEOPLE SEATED IN THE AREA OR PASSING THROUGH IT. SPECIES THAT ARE INVASIVE, INJURIOUS, OR DROP EXCESSIVE DEBRIS SHOULD BE AVOIDED OR USED WITH DISCRETION.


12" MIN. SEAT SURFACE, 18" MAX.
18"-22" IS MOST COMFORTABLE HT. RANGE FOR SITTING.
SITTING SURFACES SHOULD BE PITCHED 1/8"/12" TO ALLOW SURFACE WATER TO DRAIN BACK INTO PLANTING BED.
4" OVERHANG (SEE NOTE BELOW).

- 4" OVERHANG PROVIDES SPACE FOR HEELS, WHICH MAKES SITTING MORE COMFORTABLE. ALSO ALLOWS PEOPLE TO PLACE THEIR HEELS MORE DIRECTLY BENEATH THEIR CENTER OF GRAVITY, WHICH IN TURN MAKES RISING UP OUT OF A SEATED POSITION EASIER.
- LOWER HEIGHTS BECOME INCREASINGLY DIFFICULT FOR MANY HANDICAPPED PEOPLE TO SIT INTO AND RISE OUT OF.
- 2'-0" LEG SPACE SHOULD BE PROVIDED SO THAT SEATED PEDESTRIANS DON'T BLOCK ADJACENT WALKWAYS.

Walls

In addition to their common functions of retaining earth and separating site elements, walls can be designed to provide a number of secondary functions such as seating, surfaces on which to rest packages, and support and guidance to physically restricted people.

When designing seat walls, retaining walls, and free-standing walls, the designer should consider the following items:

1. **Seat Walls:**
   a. Seat walls should be between 18" and 22" high in order to accommodate physically restricted people. Walls lower than this present a hazard as they are easily overlooked.
   b. A width of at least 12" is required for comfortable seating on the top surface of any wall.
2. **Low Retaining Walls:**
   a. Retaining walls between 2'-0" and 3'-0" are useful in providing surfaces to lean against in a half-sitting position, or as a surface to sit upon. Wheelchair users can easily rest packages on walls of this height.
   b. Walls between 3'-0" and 4'-0" in height are particularly good for package rests. They are difficult for most people to sit on, however.
   c. Where pedestrian or bicycle traffic occurs adjacent to the top of a wall, a barrier should be incorporated between the walkway and the edge to prevent people from inadvertently falling off. Barriers can be either a railing device or a natural hedge. See "Railings".
3. **High Retaining and Free-Standing Walls**
   a. These walls are above 4'-0" in height.
   b. Too high for seating, these walls are useful to the handicapped only with the addition of a handrail. Handrails should be located according to specifications in the "Handrail" section.

c. Where walls are located adjacent to walkways, weep holes should not be located so as to drain out onto the walking surface. Water drainage could form ice spots during winter months.

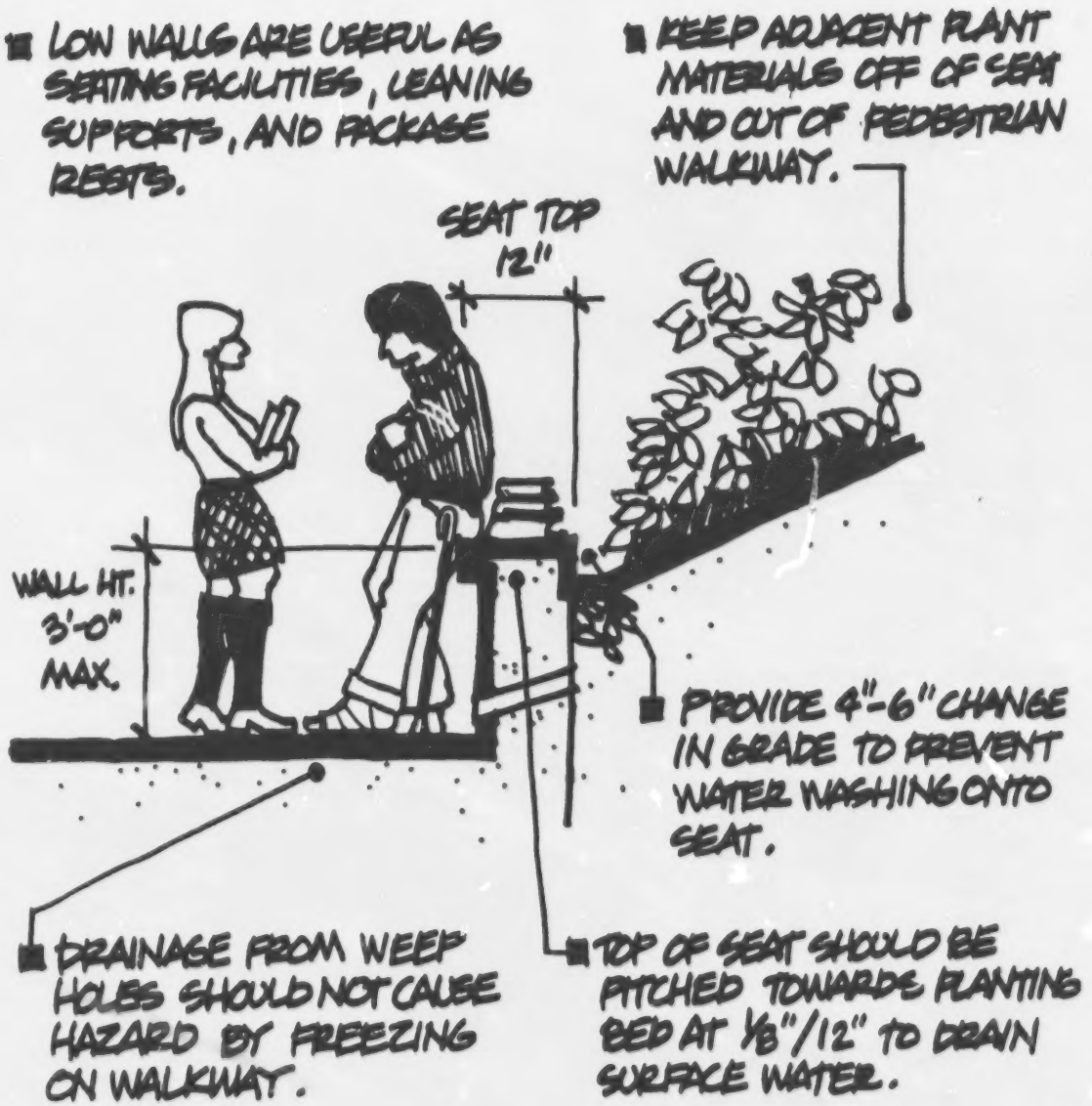
d. Drain pipes should not project past the face of any wall. Likewise, walls should be free of any projections or appendages which might prove dangerous to people passing by.

e. For inherent reasons of safety, all walls should be maintained in good condition.

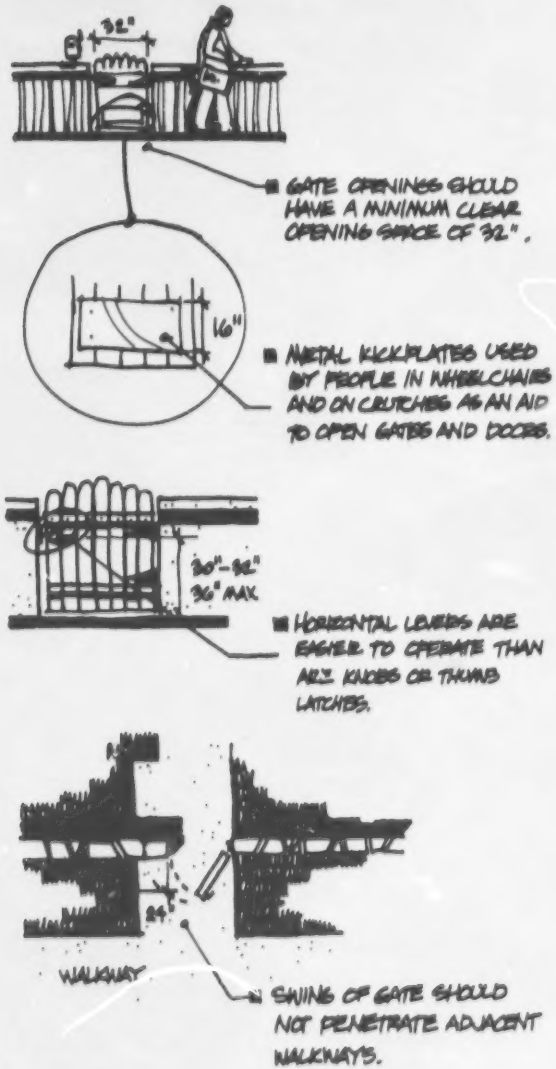
Gates used in the exterior environment should adhere to the same critical dimensions, design treatments, opening forces, etc., that apply to doors inside of a building since restricted people are obliged to use them in much the same manner.

Items to consider when designing gates are:

1. The minimum width dimension on a gate should never be less than 34" which, if one assumes a 2" thickness on the gate allows a 32" clear opening passageway when the gate is open.
2. The gate should have a latching mechanism that is operable by a lever or some other similar device.
3. Where a gate is likely to receive heavy use, a 16" high metal kickplate should be installed across its entire width. This is to prevent damage to the gate itself from crutches or wheelchair foot rests.
4. Where the gate has a self-closing mechanism, the force required to open it should not exceed 5 lbs. preferred (8 lbs maximum). The closing mechanism should also have a time delay to prevent the gate from closing too quickly on the person passing through it.


LOW WALLS ARE USEFUL AS SEATING FACILITIES, LEANING SUPPORTS, AND PACKAGE RESTS.
KEEP ADJACENT PLANT MATERIALS OFF OF SEAT AND OUT OF PEDESTRIAN WALKWAY.
SEAT TOP 12"
WALL HT. 3'-0" MAX.
PROVIDE 4"-6" CHANGE IN GRADE TO PREVENT WATER WASHING ONTO SEAT.
DRAINAGE FROM WEEP HOLES SHOULD NOT CAUSE HAZARD BY FREEZING ON WALKWAY.
TOP OF SEAT SHOULD BE PITCHED TOWARDS PLANTING BED AT 1/8"/12" TO DRAIN SURFACE WATER.

Gate Recommendations


32"
GATE OPENINGS SHOULD HAVE A MINIMUM CLEAR OPENING SPACE OF 32".
16"
METAL KICKPLATES USED BY PEOPLE IN WHEELCHAIRS AND ON CRUTCHES AS AN AID TO OPEN GATES AND DOORS.
30"-32"
36" MAX.
HORIZONTAL LEVERS ARE EASIER TO OPERATE THAN ARE KNOBS OR THUMB LATCHES.
24"
WALKWAY
SWING OF GATE SHOULD NOT PENETRATE ADJACENT WALKWAYS.

5. In some instances, an automatic opening mechanism may be helpful.
6. **Levers and Handles:**
   a. The use of knobs or mechanisms which require a grasping operation are not recommended since they are usable only by people with free hands and fingers. Knobs are also extremely difficult for people with partial or total manual handicaps to operate. Horizontal levers and handles should be used when and where possible since they are much easier to manipulate.
   b. Horizontal levers and handles should be placed preferably between 30" to 32" above the floor (36" maximum).
   c. Horizontal levers and handles are easier to grip by most people than are vertical ones.
7. **Baffles:**
   Baffles are commonly used for entries into restroom facilities or shelters. They serve the function of effectively blocking direct view into the facility without hindering access to it.

   The following items should be considered in the design of baffles:
   a. There should be a minimum clearance between the walls of a baffle of 4'-0".
   b. Simple handrails between 2'-8" and 3'-0" high should be mounted on the walls of the baffle to aid semi-ambulant people in moving through it.
   c. Handrails should be able to support 250 lbs.

Fencing is one element in the exterior environment that has specifically been used as a barrier. For this reason, the subject matter below will only deal with safety factors involved when fencing is used in public areas.

When using fencing, the designer should be aware of the following conditions:

1. Unless specifically designed for security purposes, fencing should not present any unnecessarily dangerous situations for children or other people who might be tempted to climb over or on it.
2. Posts should be sunk adequately into the ground so that the fence does not collapse during high winds or with the weight of a climber.
3. The fence fabric should be well secured to all posts for similar reasons.
4. Fencing should be free of any projections or appendages which might prove dangerous to people on an adjacent walkway, playing field, etc.

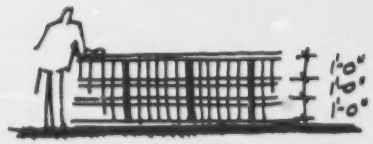
1. Railings should be placed between 2'-6" to 3'-0" off the ground.
2. Where safety is an important concern, there should be at least 2 parallel bars that occur below the top rail. These should be no further apart than 1'-0". Additional security may be had with the application of a structural screen to the railing.
3. A 2" to 3" high curb placed 4" in front of a railing will prevent the footrest of a wheelchair or other wheeled vehicle from striking the vertical supports of the railing as it moves adjacent to it.
4. Railings should be designed to support a minimum of 250 lbs. and should be kept securely fastened at all times.
5. **Chains:**
   a. Chains intended for use as protective safety barriers should be avoided. Their inher-

ent flexibility does not lend itself well to either stopping pedestrian traffic or to giving solid support to someone needing it. Their best use is to act as an inexpensive vehicle barrier. Although unless adequately identified, they may present an extreme hazard to bicyclists, motorcyclists, and the partially sighted or blind.

b. When used as vehicle barriers, chains should be suspended between sturdy, well-anchored supports in such a way that at the lowest, or most slack point, the chain is a minimum of 2'-8" above the ground.

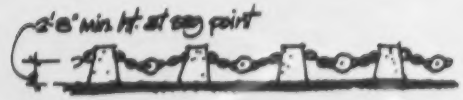
c. The chain should be well marked with reflectorized devices so that it can be easily seen at night.

Rail Spacing



- Spacing between vertical and horizontal members should avoid 5" to 7" openings since children's heads are easily caught between members.

Chain Barriers



- Chains can be extremely hazardous to pedestrians, bicyclists, and motorcyclists since they are extremely difficult to see, especially when below the 2'-8" level.
- Reflectorized devices should be placed on chains to warn nighttime travelers of their presence.

- All exposed fastening devices and fabric edges should be rounded off or "knuckled" to prevent cuts and abrasions.

- Additional space should be provided here to retain objects from falling onto lower level. Set back also gives many people a greater sense of security where heights are great.

- provide additional protection where heights are great or where children might crawl through.
- 2"-3" curb prevents objects from rolling under railing.

General Considerations for Railings

Waiting Areas, Drop-off Zones, and Parking

Considerations for Waiting Areas

Bus Stop Shelters
a.) allow views of oncoming busses
b.) bus route information
c.) shelter from elements
d.) sidewalk lighting
e.) transparent sides for visability & safety.
f.) provide space for wheel-chairs.
BUS
allow space for strollers, canes, wheelchairs, etc.
space large enough for people in groups.
shaded sitting provides greater comfort for extended wait.

Transportation mode change areas such as parking lots, bus stops, train stations, and air-line terminals tend to be confusing and difficult to negotiate due to their size, the large amounts of traffic usually associated with them, and the necessity to change grade levels. Generally, if access through these areas is made simple for wheelchair dependent people, or for people pushing strollers or dollies, then access is made easier for all people. The three major site areas concerned with mode change are waiting areas, drop-off zones, and parking facilities.

Waiting Areas

Waiting areas for mass transit are perhaps the most common of all exterior waiting areas. Due to the large amount of time spent waiting for buses and trains, it is important that these areas be physically accommodating for all people.

When designing exterior waiting areas, the following items should be considered:

1. The waiting area should be large enough to comfortably accommodate the average number of people normally using it.
2. Seating should be provided for the average number of daily users, with space also alotted to park wheelchairs, strollers, and other wheeled vehicles.
3. Where possible, an overhead shelter or canopy should be used to minimize the effects of the weather. Care should be taken to locate vertical support posts out of the paths of pedestrians either using or passing near the shelter. If the shelter is enclosed, adequate space must be allotted for easy movement into and through it.
4. Make sure that waiting area designs allow passengers to see approaching vehicles before they arrive at the stop. This courtesy allows all passengers time to adequately prepare themselves for boarding and as a result, shorten loading times for vehicles and reduce embar-

rassing situations for handicapped individuals.

5. Loading areas should be designed so that circulation from the waiting area is uncomplicated and over paved surfaces. The loading area itself should not have a curb that must be climbed. If a curb cannot be avoided, a 1:6 ramp will be necessary.
6. For recommended lighting levels, see "Lighting Section".
   See also "Walks," "Signage," and "Site Furniture" Sections.

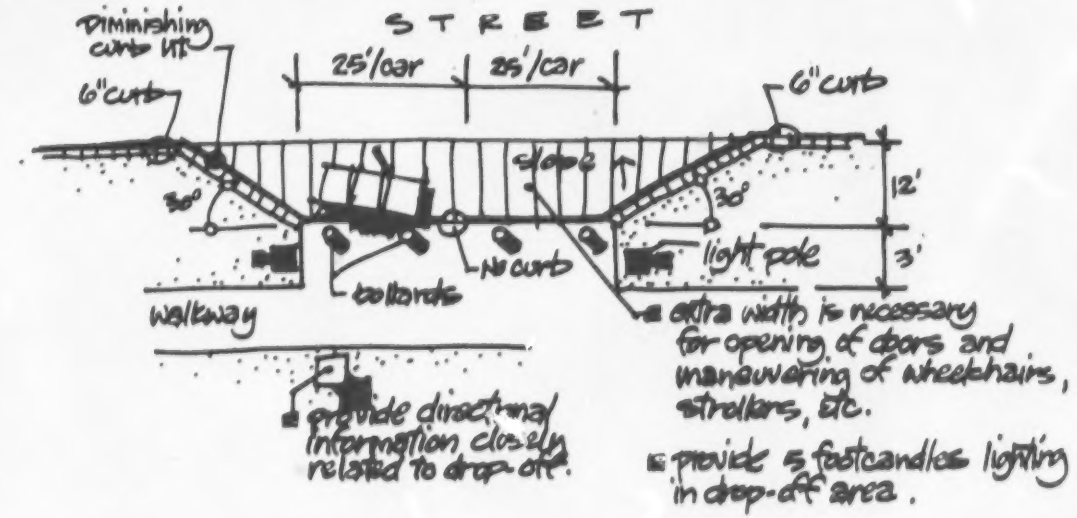
Drop-off Zones

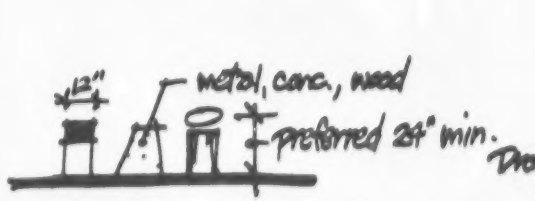
Drop-off zones are beneficial for letting off and picking up people who are laden with packages, have children in strollers, or are physically restricted in some way.

The designer should consider the following items:

1. The width of the drop-off zone should be a minimum of 12'-0" wide to allow the car doors to be fully opened for ease of access.
2. Length of the zone should accommodate at least 2 cars, allowing 25'-0" for each, and should have gradual access to the main road.
3. Where the zone is at the same grade as the adjacent walk, bollards or some other suitable device should be used to separate the two functions. Where a curb exists and cannot be removed, one small 1:6 ramp per car should be provided to make the grade change.
4. Signage should be provided to identify the drop-off zone and limit its defined use to a "pick-up — drop off" function.
5. For recommended lighting levels, see "Lighting. Considerations."
6. **Bollards:**
   a. Bollards are useful as traffic control devices as they allow for pedestrian access

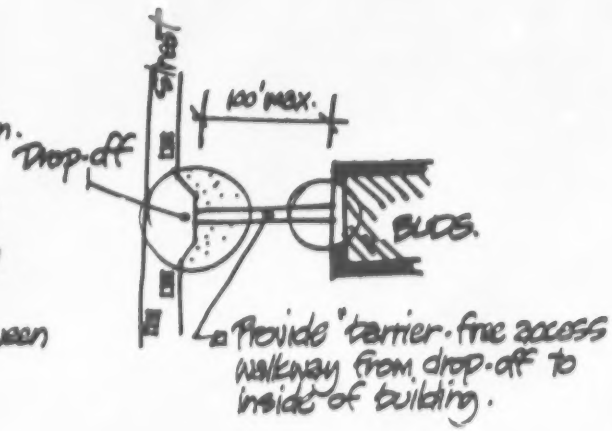
Drop-Off Areas



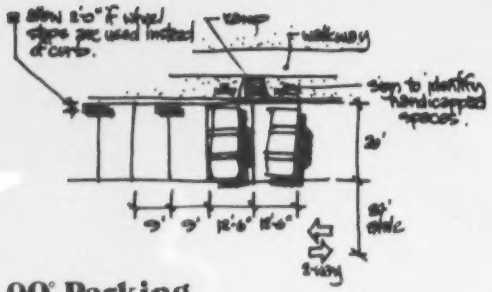


1. 12" wide allows use of bollard as temporary "seat" for person awaiting ride.
2. Allow 4'-0" clear opening between bollards. 8'-0" maximum.

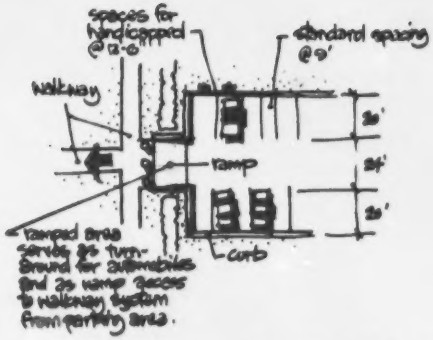
Bollards



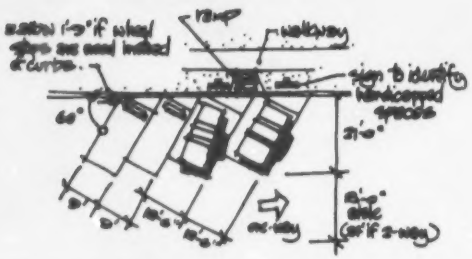
Distance to Building



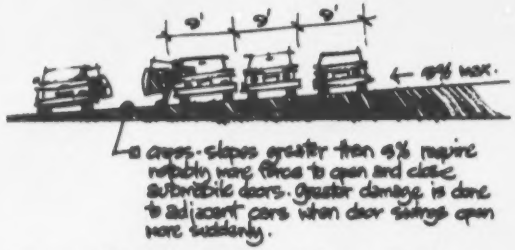
90° Parking



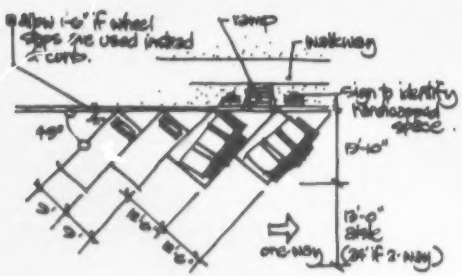
Parking Using End-Lot Access



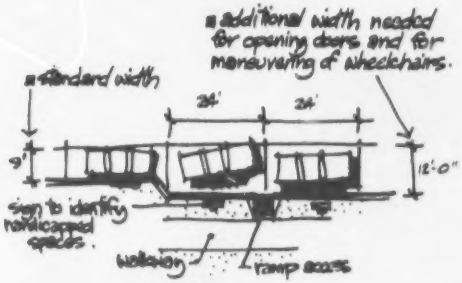
60° Parking



Cross-Slope in Parking Areas



45° Parking



Parallel Parking

while halting vehicular access. They should be spaced a minimum of 3'-0" apart to allow a wheelchair to pass.

b. Bollards can be useful for seats if they are at least 12" wide, and between 18" to 24" high.

c. Bollards should be painted in a contrasting color to the paving they rest on and should be well illuminated at night to minimize the risk of a person inadvertantly walking into them.

Parking

1. Parking spaces of greater width than normal are necessary for people who are disabled and use mechanical aids such as wheelchairs, crutches, and walkers. For example, a person who is chairbound must have a wider aisle in which to set up his wheelchair.
2. A minimum of two spaces per parking lot should be designed for use by physically restricted people, or at least one space per 20 cars, whichever is greater.
3. These spaces should be placed as close as possible to a major entrance of a building or function, preferably no more than 100'-0" away.
4. For recommended lighting levels, see "Lighting Considerations."
5. **Parallel Parking:**
   Parallel parking spaces should be placed adjacent to a walk system so that access from the car to the destination is over a hard surface. Such spaces should be made 12'-0" wide, 24'-0" long and should either have a 1:6 ramp up to the walk, or should be separated from it by bollards or some other device if the road level is at the same elevation as the walk. These areas should be designated as special

parking since they may otherwise appear to be a drop-off zone.

6. **90 Degree and Angled Parking:**
   a. Spaces designed for use by disabled people functioning with large mechanical aids as described above, should be 9'-0" wide as a minimum. In addition to the 9'-0", a 3'-6" to 4'-0" wide aisle between cars should be provided for access alongside the vehicle. It is important that there be plenty of room to open the car door entirely, and in the case of a dependent chairbound person, that there be room for friends or attendants to assist him out of the car, into his chair, and away from the car.

   b. The 9'-0" wide standard space width for a parking stall, with no aisle between spaces, does not drastically hinder semi-ambulant people with minor impairments, but an 8'-0" width, unless used exclusively for attendant parking, is too narrow and should be avoided.

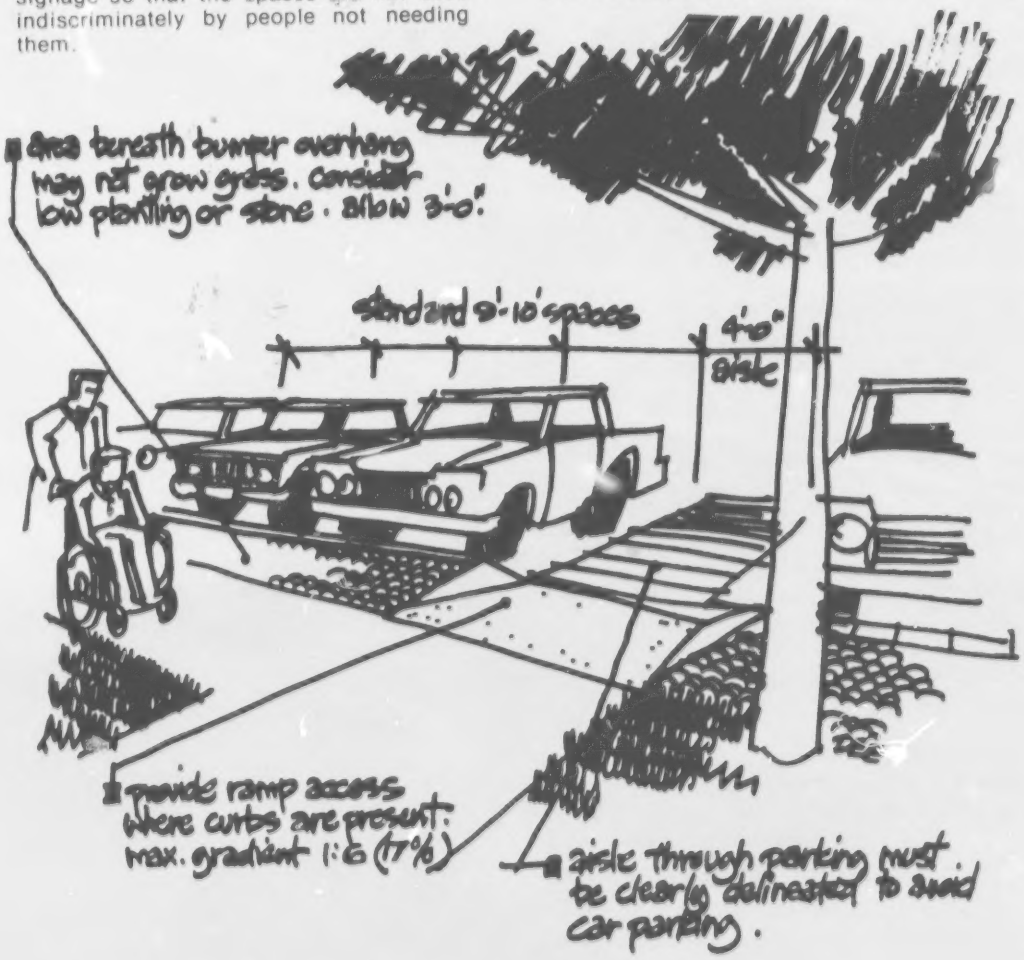
   c. A 4'-0" minimum clear aisle width should be provided between rows of cars parked end to end. The overhang of the automobile should be taken into account so that the island strip is wide enough to leave a 4'-0" clear aisle when the stalls are filled. A strip 8'-0" wide is a recommended minimum for an on-grade aisle, and 10'-0" is a recommended minimum where the aisle is raised 6" above the parking level.

   d. If the aisle between rows of cars is not at the same grade level as the cars, then ramps must be provided to mount the curbs. A 1:6 (17%) ramp is suitable for such a short distance.

   e. Economically, the installation of an on-grade 4'-0" wide pathway is less expensive than a raised walk. Precast car stops to delineate the passage can be used providing that a 4'-0" wide space between the ends of stops is maintained to allow access to the main passageway.

f. Parking spaces specifically designed for restricted individuals should be set aside and properly identified through the use of signage so that the spaces are not used indiscriminately by people not needing them.

7. Special elevated platforms, or mechanical lifts attached to vehicles must be provided to facilitate boarding and disembarkment by wheelchair bound people from mass transit vehicles.


area beneath bumper overhang may not grow grass. consider low planting or stone. allow 3'-0".
standard 9'-10' spaces
4'-0" aisle
provide ramp access where curbs are present. max. gradient 1:6 (17%)
aisle through parking must be clearly delineated to avoid car parking.

Aisle Spaces for Pedestrians

Vegetation Considerations

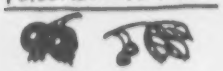
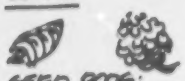
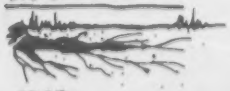
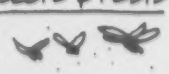
Outdoor Plantings

- OVERHEAD MATERIALS SHOULD BE CHOSEN FOR THEIR PARTICULAR CHARACTERISTICS. AVOID MATERIALS THAT HAVE TENDENCIES TOWARDS DROPPING EXCESSIVE DEBRIS DROOPING OR BREAKING UNDER HEAVY SNOW LOADS, OR WINDS, ETC.
- MAINTAIN A MINIMUM OF 8'-6" VERTICAL CLEARANCE OVER WALKS, BIKEWAYS, SITTING AREAS, ETC.
- IMPROPER LOCATION OR POOR MAINTENANCE CAN QUICKLY LEAD TO A REDUCTION OF THE EFFICIENCY OF LIGHTING SYSTEMS.
- AVOID PLACING HAZARDOUS OR NUISANCE MATERIALS ADJACENT TO WALKWAYS OR SITTING AREAS.
- PLANT MATERIALS MAY AFFECT THE MELTING OF ICE AND SNOW FROM WALKWAYS AND STAIRS CONSIDER THEIR MATURE SHADOW PATTERNS DURING WINTER MONTHS BEFORE DECIDING ON THEIR FINAL LOCATIONS.
- MANY TREES WITH SHALLOW OR SURFACE ROOT SYSTEMS WILL HEAVE OR BREAK UP WALKWAY SURFACES. USE CAUTION WHEN CHOOSING THESE VARIETIES AND THEIR SUBSEQUENT LOCATIONS.
- AVOID PLACING MATERIALS OVER OR NEAR UNDERGROUND UTILITIES. IF THEY HAVE ROOT SYSTEMS THAT CHARACTERISTICALLY CAUSE DAMAGE TO PIPELINES, CABLES, SEWERS, ETC.
- CREEPING GROUND COVERS, VINES AND OTHER INVASIVE MATERIALS CAN BE TROUBLESOME IF NOT CONTAINED— KEEP THEM OFF BUILDINGS, WALKWAYS STEPS, RAMPS, SIGNS, AND LIGHTING FIXTURES.

Fundamentals

Listing the mechanics for introducing plant materials in public areas is beyond the scope of this book. However, there are some very basic considerations worth mentioning concerning placement, choice, and maintenance that should be observed by the designer.

1. Potentially dangerous plants such as those having large thorns or those with poisonous fruit should not be placed immediately adjacent to major walks where they may present a hazard. This is not to say that such plant material should not be used near heavily travelled areas, but only that it should be used with discretion. (See chart next page)
2. Proper maintenance of plant material is necessary to assure that dangerous situations do not arise. Seed pods, berries or fruit that may produce a slippery surface should be removed. Branches that overhang walks should be pruned to a height of 8'-6" above the ground to prevent eye or face injuries.
3. In areas where snow is a common winter occurrence careful consideration should be given to the type and location of plants which will be placed along public thoroughfares because:
   a. Species which have a tendency to break under ice and snow loads should be kept away from heavily trafficked areas.
   b. "Snow droop" can cause branches to bend below a safe level above walkways and streets. It should be determined whether or not these branches present a hazard so that they may be pruned accordingly.
4. Plant material is useful for providing shelter from the sun, and to an extent, from the wind.
5. Plant materials can be used effectively as barriers in controlling the movements of people through public spaces or in keeping them away from hazardous areas.
6. Avoid placement of planting materials where their shadows might prevent the effective melting of ice and snow by the sun.

Hazard/Nuisance	Species	Comments
1. POISONOUS PLANTS: 	HOLLY, YEW, PRIVET, LAUREL, RHODODENDRON.	CHILDREN MAY BE TEMPTED TO SAMPLE BRIGHT COLORED BERRIES OR LEAVES.
2. DEBRIS:		
a. FRUITS & NUTS:	CRABAPPLE, PLUM, CHERRY, OAK, CHESTNUT, HICKORY, WALNUT.	LONG, STRAP-LIKE PODS, BERRIES, CONES, & NUTS, CAN BE SLIPPERY OR DIFFICULT TO WALK ON. THEY ARE EASILY TRACKED INTO BUILDINGS, AND CAN STAIN CLOTHING IF SAT UPON.
b. CONES: 	PINES, SPRUCE, FIR, LARCH, HEMLOCK.	CONES, WHILE HAVING MANY DECORATIVE USES CAN CAUSE PROBLEMS FOR PEDESTRIANS AND SMALL-WHEELED VEHICLES WHEN THEY FALL ON WALKWAY SURFACES.
c. SEED PODS:	SWEETGUM, SYCAMORE, LONDON PLANETREE, HONEY LOCUST MAPLE.	PODS CREATE UNSURE FOOTING FOR PEDESTRIANS AND HINDER THE MOVEMENTS OF SMALL-WHEELED VEHICLES.
d. BRANCH BREAKAGE:	BIRCH, SILVER MAPLE, BOX-ELDER, HORSE CHESTNUT, POPLAR, WILLOW, TULIPTREE, ELM.	BRANCH DEBRIS IS DIFFICULT TO WALK ON OR PUSH SMALL-WHEELED VEHICLES OVER. LARGE BRANCHES CAN CAUSE EXTENSIVE DAMAGE TO ITEMS ON WHICH THEY MIGHT HAPPEN TO FALL, SUCH AS CARS, SMALL WOOD FRAM STRUCTURES, ETC.
3. DROOPING BRANCHES:	BIRCH, WILLOW, PIN OAK, BEECH, MAGNOLIA.	BRANCHES CAN DROP BELOW MINIMUM CLEARANCES ON WALKWAYS OR STREETS CAUSING FACIAL OR EYE INJURIES TO PEDESTRIANS OR HAZARDS FOR MOTORISTS.
4. SHALLOW ROOTS: 	WILLOW, RED MAPLE, SILVER MAPLE, BEECH, COTTONWOOD, POPLAR VARIETIES	SURFACE ROOT SYSTEMS CAN CAUSE WALKS TO HEAVE AND BREAK APART WHICH IN TURN CAN CAUSE PEDESTRIANS TO TRIP AND FALL. UNEVEN OR BROKEN SURFACES CAN BE EXTREMELY DIFFICULT TO PUSH SMALL-WHEELED VEHICLES OVER.
5. ODOR:	SIEBOLD VIBURNUM, FEMALE GINKGO	FOUL SMELLING ODORS NOT ONLY DETRACT FROM AN AREA'S AESTHETIC APPEAL BUT TEND TO MAKE SOME PEOPLE NAUSEOUS.
6. THORNS & SPIKES:	BARBERRY, QUINCE, HAWTHORNE, LOCUST, HOLLY, ROSE VARIETIES PRIVET	PLANTS WITH THORNS OR SPIKES CAN BE EXTREMELY PAINFUL TO BUSH AGAINST OR FALL INTO. LEAVES, TWIGS, OR BRANCHES WHICH FALL TO THE GROUND ARE ALSO HAZARDOUS FOR PEOPLE IN BAREFEET OR LIGHT FOOTWARE.
7. INSECTS & PESTS: 	FRUIT TREES (CRABAPPLE, CHERRY PLUM, ETC.) MOUNTAIN LAUREL	BECAUSE OF THE SEVERE REACTION CERTAIN PEOPLE HAVE TO MANY INSECT BITES AND STINGS, THE LOCATION OF PLANT MATERIALS WHICH ATTRACT THESE PESTS ARE NOT RECOMMENDED FOR AREAS ADJACENT TO WALKS OR SITTING AREAS.

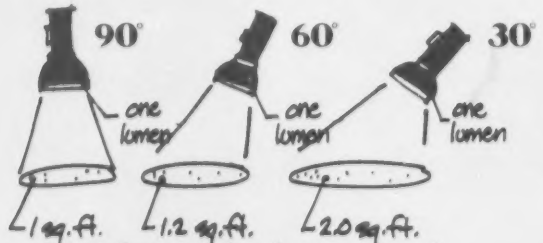
Lighting Considerations

Lumen:

A unit for measuring the amount of light energy given off by a light source (bulb).

Footcandle:

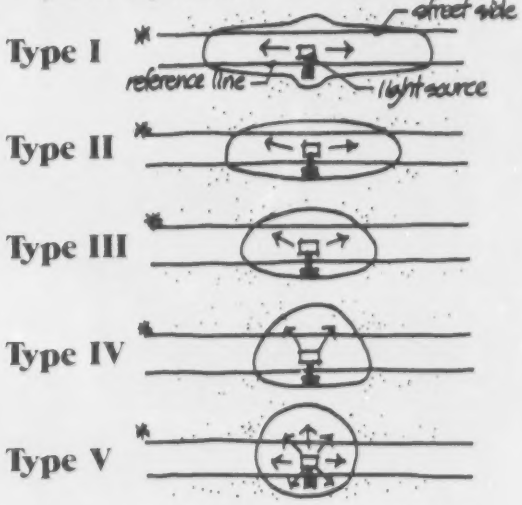
A unit for measuring the amount of illumination on a surface.



The amount of useable light from a given source will vary according to the angle of incidence and the distance to the illuminated surface.

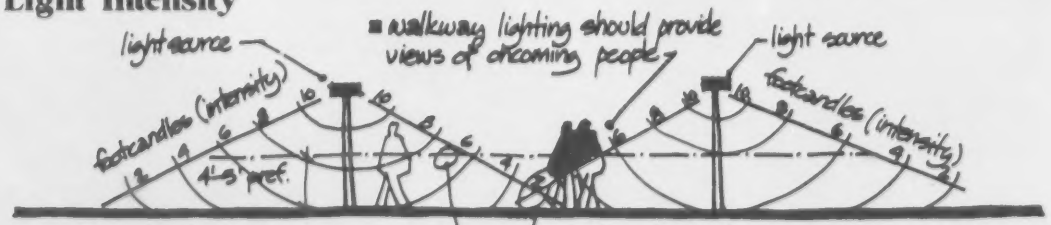
Lateral Light Distribution

- Light patterns can be varied according to the needs of a particular situation. Choose the proper pattern and fixture for your specific requirements.



* IES standard light pattern classifications.

Light Intensity



Avg. Maintained Footcandles

- Measured at average point of illumination between brightest area and darkest areas. Can be measured at ground surface or at 4'-5' above walkway surface.

Min. Maintained Footcandles

- Measured on ground surface at point of least illumination.

Note: Where intensity curves overlap, the resulting intensity is the combined total of the two ratings.

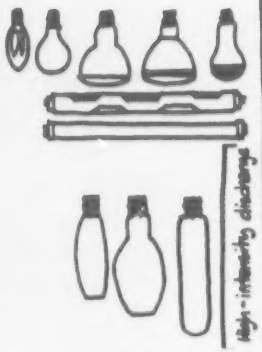
Purpose and Application

The purpose of site lighting is basically twofold: (1) to illuminate, and (2) to provide security. Lighting should be provided in areas that receive heavy pedestrian or vehicular use and in areas that are dangerous if unlit, such as stairs and ramps, intersections or abrupt changes in grade. Likewise, areas that have high crime rates should be well lit in order that people traveling at night may feel personally secure from attack.

The phrase "well lit" has a wider meaning than simply higher light levels. Unless light is placed where it is really the most useful, the expense of increasing footcandle levels is wasted. An area may need only the addition of a few more lights to correct its problems, not an increase in light levels from fixtures that are too few, or poorly located.

When considering the installation or renovation of lighting systems, the designer should be aware of the following considerations:

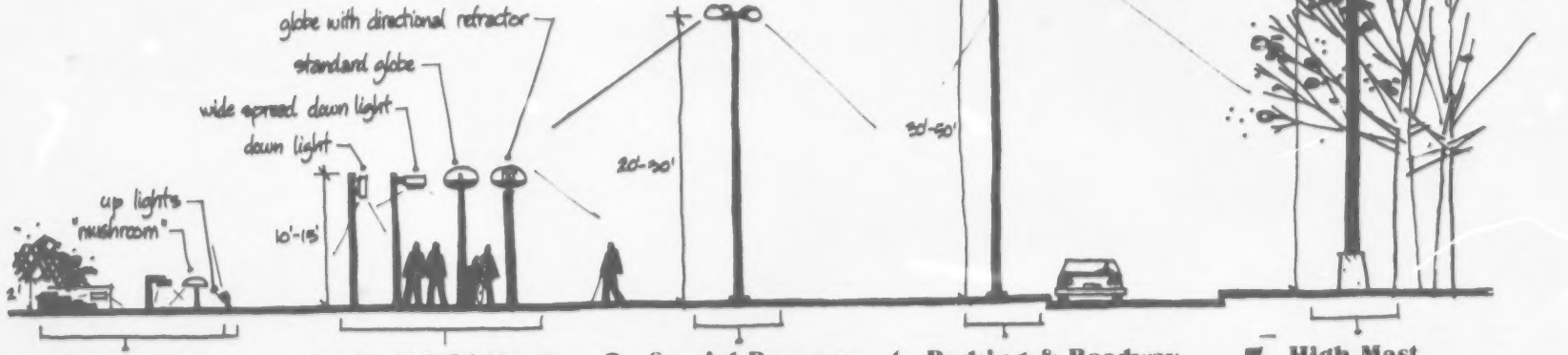
1. Overhead lamps have the advantage over low-level fixtures of providing better economy and more even light distribution.
2. Fixtures should be placed so that light patterns overlap at a height of 7'-0", which is sufficiently high to vertically illuminate a person's body. This is a particularly important consideration now that lighting fixture manufacturers are designing luminaires with highly controlled light patterns.
3. At hazardous locations such as changes of grade, lower level supplemental lighting or additional overhead units should be used.
4. Where low-level lighting (below 5'-0") is used, fixtures should be placed in such a way that they do not produce glare. Most eye levels occur between 3'-8" (for wheelchair users) and 6'-0" for standing adults.
5. Posts and standards along thoroughfares should be placed so that they do not present hazards to pedestrians or vehicles.
6. A minor consideration is the use of shatterproof coverings on low-level lighting where



LAMP TYPE	WATTAGE RANGE	EFFICIENCY (lumens/watt)	LIFE (hours)	COLORS STRENGTHENED	COLORS DIMINISHED	REMARKS
Incandescent	15-1000	low	750-2000	yellow, red, orange	blue	good color rendition
Deluxe Cool-White Fluorescent	15-215	medium	7,500-15000	all	none	best overall color rendition
Deluxe White Mercury	90-1000	medium	10,000-24,000	blue, red, yellow	green	good color rendition
Metal Halide	175-1000	high	7500-10,500	yellow, blue green	red	good color rendition
High-Pressure Sodium	250-1000	high	10,000-15,000	yellow, green orange	red, blue	poor color rendition

Lamp Types & Characteristics

NOTE: All exterior installations must be provided with ground-fault interruption circuit.



1. Low Level

- heights below eye level
- very finite patterns with low wattage capabilities
- incandescent, fluorescent
- least maintenance requirements but highly susceptible to vandals

2. Mall & Walkway

- 10'-15' heights average
- multi-use because of extreme variety of fixtures and light patterns
- incandescent, mercury vapor
- susceptible to vandalism

3. Special Purpose

- 20'-30' heights average
- recreational, commercial, residential, industrial
- metal halide, mercury vapor
- fixtures maintained by gantry.

4. Parking & Roadway

- 30'-50' heights average
- large recreational, commercial, industrial areas; highways
- Mercury vapor, high-pressure sodium
- fixtures maintained by gantry.

5. High Mast

- 60'-100' heights average
- large area lighting - parking recreational, highway interchanges
- Mercury vapor, high-pressure sodium
- fixtures must lower for maintenance

IES Recommended Lighting Levels

		Commercial	Industrial	Residential
I.	**Pedestrian Areas**			
	1. SIDEWALKS	0.9*	0.6	0.2
	2. PEDESTRIAN WAYS	2.0	1.0	0.5
II.	**Roadways**			
	1. FREEWAYS	0.6	0.6	0.6
	2. MAJOR AND EXPRESSWAYS	2.0	1.4	1.0
	3. COLLECTORS	1.2	0.9	0.6
	4. LOCAL	0.9	0.6	0.4
	5. ALLEYS	0.6	0.4	0.2
III.	**Parking Areas**			
	1. SELF PARKING	1.0	-	-
	2. ATTENDENT PARKING	2.0	-	-
IV.	**Buildings**			
	1. ENTRANCE, DOORWAY AREAS	5.0	-	-
	2. GENERAL GROUNDS	1.0	-	-

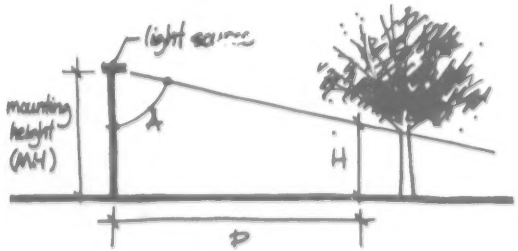
*SOURCE: IES LIGHTING HANDBOOK, 4th EDITION
ILLUMINATING ENGINEERS SOCIETY, NEW YORK CITY, NY

* VALUES ARE GIVEN IN MIN. AVG. MAINTAINED HORIZONTAL FOOTCANDLES.

there is the chance of breakage from vandalism or mishaps from people playing frizbee, football, baseball, etc. The absence of any resulting broken material will reduce otherwise potential hazards.

7. **Peripheral Lighting:**
When walkway lighting is provided primarily by low fixtures, there should be sufficient peripheral lighting to illuminate the immediate surroundings. Peripheral lighting provides for a better feeling of security for an individual since he can see into his surroundings to determine whether or not passage through an area is safe. Such lighting should be approached from one of two ways:
   a. By lighting the area so that an object or person may be seen directly.
   b. By lighting the area to place an object or person in silhouette.

IES Tree Pruning Recommendations*

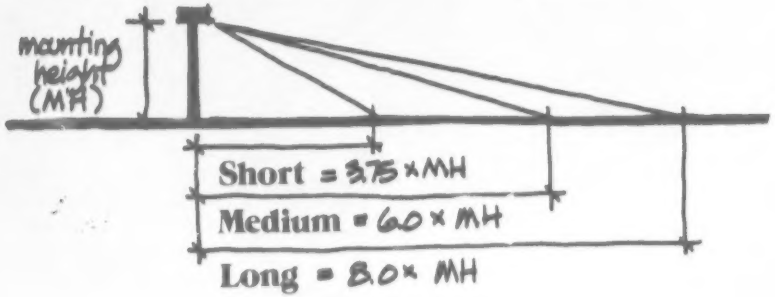


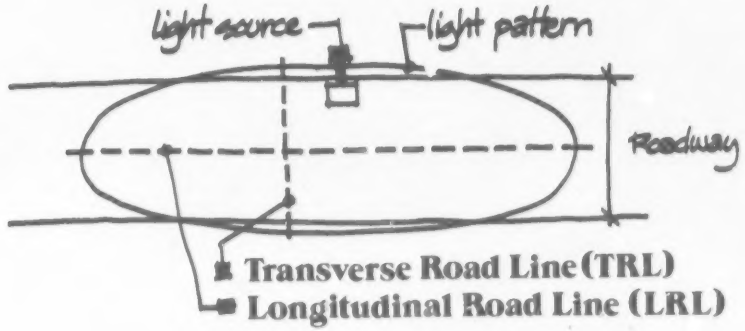
A	H
70°	MH minus .96 D
75°	MH minus .46 D
80°	MH minus .17 D

*source: IES Handbook

Types of Distribution

(Note: "Distribution" is measured along LRL)



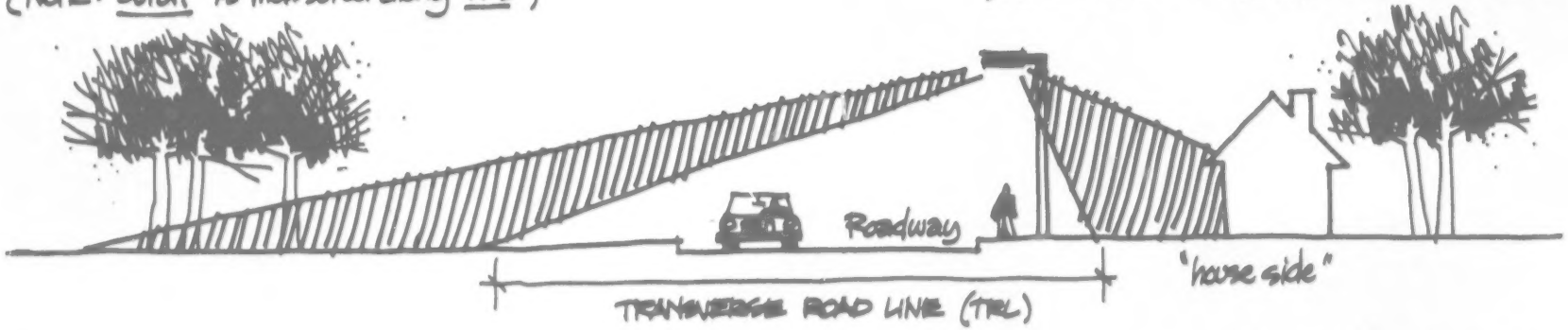


Note: degree of cutoff is determined either by:

a.) Design of fixture housing
b.) Incorporation of prismatic lens over light source.
c.) Addition of shield to fixture on "house side."

Cutoff Terminology

(Note: "cutoff" is measured along TRL)

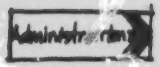


1. Cutoff means maximum of 10% of light source lumens fall outside the TRL area.
2. Semi-Cutoff means maximum of 20% of light source lumens fall outside the TRL area.
3. Non-Cutoff means no control limitations.

Signage Considerations

Sign Categories & Descriptions

1. Directional

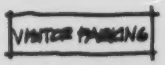


Usually included with an arrow; are used for indication of a change in route, or confirmation of a correct direction.

2. Informational

Used for overall information for general organization of a series of elements; i.e. campus plan, bus routes, building layout, shopping mall plan, etc.

3. Identification



Gives specific location information, identifies specific items; i.e. parking lot "b", building #5, First Aid, etc.

4. Regulatory

Gives operational requirements, restrictions, or gives warnings. Usually used for traffic delineation or control; i.e. "stop" signs, "no parking," "one way," etc.

Fundamentals

Essentially, signs should perform three functions. They should: (1) Identify a place and indicate whether or not it is accessible to everyone; (2) Indicate warnings where necessary; and (3) Give routing information.

The information given on signs should always be clear, precise, and sign locations should never present unnecessary hazards for pedestrian or vehicular traffic.

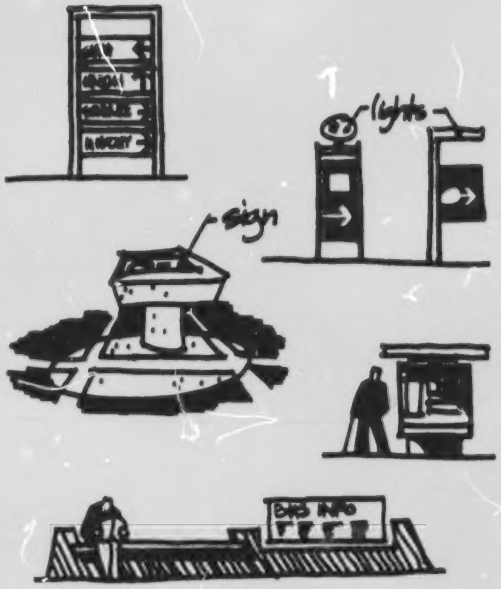
1. **Identification and Accessibility:**
   - a. Key site-related areas that should be identified by sign posting are:
     1. Traffic signs announcing public rest stops with accessible facilities.
     2. Public lavatories accessible to pedestrians.
     3. Special car parking.
     4. Directional signs for vehicles and pedestrians such as "one way" street signs.
     5. Signs identifying accessible entrances to buildings or facilities.
     6. Informative signs on buildings.
   - b. In order that signs be made more useful to everyone, they should be designed to be readable by all people, including the visually handicapped. This can be accomplished in a number of different ways:
     1. Braille strips can be placed along sign edges.
     2. Raised or routed letters are readable by the blind or partially sighted.
     3. Graphic symbols are useful in transmitting messages quickly, but should be avoided as the sole means of imparting information because they can be confusing to the blind.
     4. Signage that will be used by the visually handicapped must be located in a manner that first allows the sign to be recognized and second, allows the sign surface to be touched by the reader's hand.
     5. Signs along walkways or corridors should be set back a minimum of 18" and placed at a height of 4'-0" to 5'-6".
   - c. The international symbol for access, the abstract man in a wheelchair, is already in extensive use in this country. It is used to show where special provisions have been made to allow access for restricted people.
2. **Warnings:**
   - a. **Textural Paving:**
     Textural paving may be used to warn of imminent hazards such as abrupt changes of grade, stairs, ramps, walk intersections, etc., and the locations of special information. However, the use of textural paving as a warning device for the blind is extremely impractical because of the widely varying nature of walkways in this country. The only effective use for such a system would be in a closed environment such as a school for the blind. Unfortunately, once away from his protected surroundings, a blind person would be vulnerable to a world full of unforewarned hazards.
3. **Routing Information:**
   Where it is critical that people be able to travel quickly and unhindered to their destinations, routing information should be given.
   - a. Hospitals, college campuses, institutions, etc., should have posted signs, lines, or arrows painted on walk systems that are accessible to wheeled vehicles, particularly where such path systems are limited in number.
   - b. Access to buildings with only one or two entrances that are accessible to wheeled vehicles should be clearly indicated by routing signs.
4. **Readability:**
   The readability of any sign is a function of many items. When designing or choosing the format of a sign, the following things should be considered:

a. Information should be as concise and direct as possible.

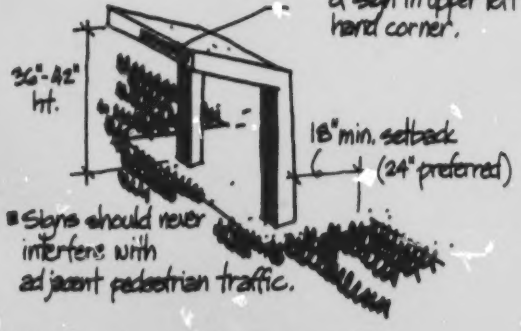
b. Lettering styles and graphic symbols should be as bold and simple as possible. Fancy styles become cluttered, are time consuming, and confusing to read.

c. Color schemes of contrasting colors with light images on dark backgrounds make signs both easier to read and more readable from longer distances.

5. **Placement:**
The placement of signs is important because wrongly located, they may present an obstacle or hazard. Unless intended to be read by the blind or the partially sighted, they should be set far enough off a traveled way and/or high enough off the ground so as not to be inadvertently walked into.



- Raised or routed letters are also helpful for the blind in reading signs.
- Informational signs should have a braille strip for the blind, often placed on edge of sign in upper left hand corner.



- Signs should never interfere with adjacent pedestrian traffic.

Braille on Signs

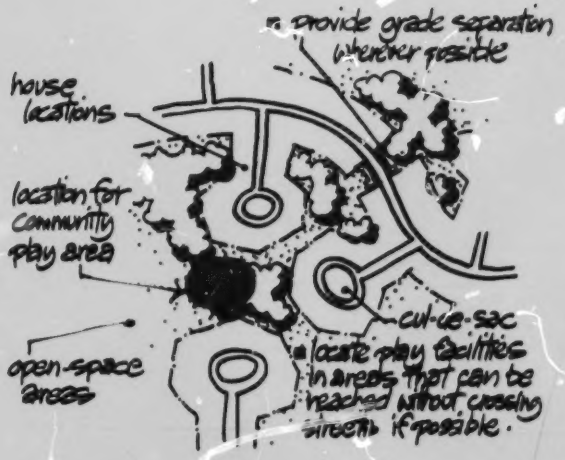
Design and Location

- When possible, gather signs together into unified systems. Avoid sign clutter in the landscape.
- Combine signs with lighting fixtures to reduce unnecessary posts and to illuminate signs - signage can't be effective in dark areas.
- Low-level informational signs can also illuminate paving below.
- Information signs should be placed at natural gathering spots and included into the design of site furniture.
- Avoid placement of signs where they may conflict with pedestrian traffic.
- Sign location should avoid conflict with door opening or vehicular operation.
- Signs should be placed to allow safe pedestrian clearance, vertically and laterally.

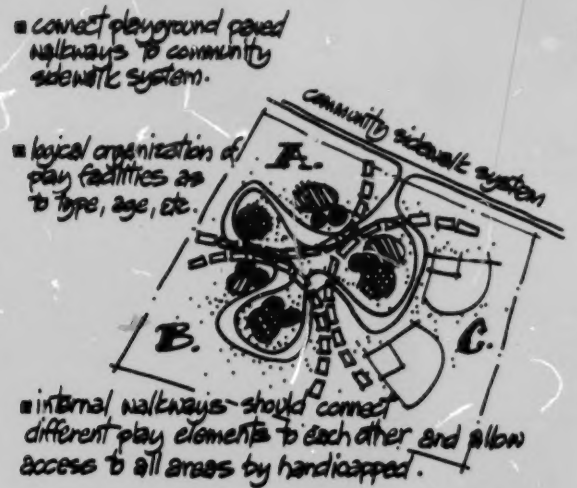
Recreation Considerations

Fundamentals of Play Areas

1. ACCESSABLE to all groups.
2. SAFETY in choice of elements
3. INTERESTING facilities & apparatus
4. CHALLANGING & INNOVATIVE in the design and layout.


house locations
location for community play area
open-space areas
provide grade separation wherever possible
cul-de-sac
locate play facilities in areas that can be reached without crossing streets if possible.

1. Community Access to Play


connect playground paved walkways to community sidewalk system.
logical organization of play facilities as to type, age, etc.
community sidewalk system
A.
B.
C.
internal walkways should connect different play elements to each other and allow access to all areas by handicapped.

2. Internal Walkways

Playgrounds

Design segregation of play facilities in regard to varying physical characteristics of children is not, generally speaking, desirable. Playgrounds that are constructed to serve the most diverse segments of society enhance the opportunity of a child's meeting and interacting with a variety of people having differing physical and social characteristics — people with whom he will have to deal in his adult life. In addition to the social aspects, a greater flexibility in the use of a playground is desirable for economic reasons.

In general, play can be grouped into two categories; (1) defined play, and (2) creative play

Defined play refers to the channeling of play activities into certain prescribed directions. For instance, swings and slides define the child's play within the limits of their function. Although children do many creative things on swings and slides, they are primarily outgrowths of the basic functions of swinging and sliding. On the other hand, creative play primarily arises from the child's imagination. The play element is somewhat amorphic and therefore undefined. A child in a sand area creates sand castles, mountains, rivers, roads, and a plethora of other fantasies straight from his mind. Likewise, free-form sculpture, random climbing blocks, or simply open areas of lawn act as springboards for the imagination.

There seems to be a current trend in which designers heavily specify creative play apparatus for playgrounds, sometimes to the exclusion of defined apparatus. This trend does not well serve children since it does not account for the child who is unable to play creatively.

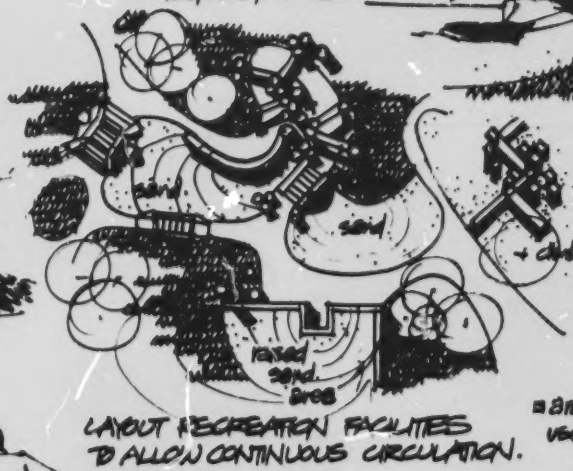
There are, for instance, thousands of children in this country alone who, handicapped by severe mental and emotional problems, are only able to achieve satisfying play through the use of defined apparatus. Likewise, an imaginative child may quickly lose interest in traditional play equipment whereas a creative apparatus may hold his attention. Therefore, the designer should strive to create a playground that will provide a rich and

■ provide ramp area at 10% max. & 3' wide. handrails are helpful for those on foot.
■ 4" curb at edge is helpful for wheelchairs
■ paved walk allows access to all areas to enable play with other children.

1. Ramped Bridge

■ 30" min. width
3'-6"
10%
10%
SECTION VIEW.
■ rocking bridge gives sensation of vertical movement to person in wheelchair. provides rubber cushions to end edges to minimise impact when end drops and to protect other children's hands if playing at end area.

2. Rocking Bridge



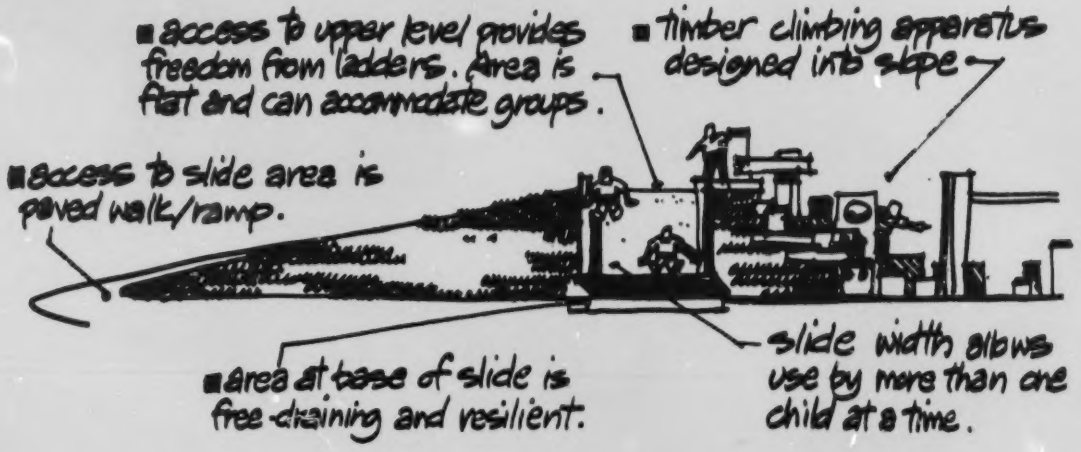
■ extending timbers to near walkway allows child with mobility problem to help himself to more central parts to play with others.
telephone pole "maze"
paved walk.

3. Climbing Timbers

■ area near wall can be used for toy cars, etc.
■ area 30" deep, 30" wide, 30" high raised sand area allows person in wheelchair to enjoy use of sand without removal from chair.

4. Raised Sand Area

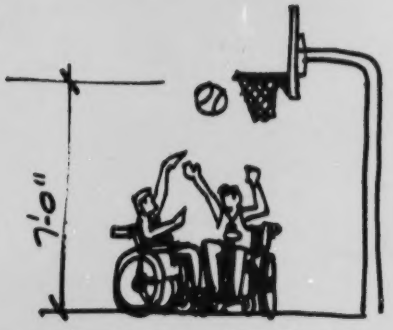
1. Slides & Climbing Areas


■ access to upper level provides freedom from ladders. Area is flat and can accommodate groups.
■ timber climbing apparatus designed into slope
■ access to slide area is paved walk/ramp.
■ area at base of slide is free-draining and resilient.
slide width allows use by more than one child at a time.

2. Elevated Sand-Tables

■ elevated area containing sand or water provides access for those in wheelchairs. Flat area is useful for toy cars, crafts, etc.

3. Basketball Hoops



■ basketball hoops lowered to 7'-0" from standard 10'-0" ht. allow those in wheelchairs and young children to enjoy the game.

wide ranging set of both defined and creative experiences.

Just as designers have been designing the environment for the "normal" man, so have playgrounds been designed for the "normal" child. Unfortunately, the child who is physically handicapped usually has restricted motor development, and as a consequence of his limited movement, does not see the world and himself in the same way as a normal individual would.

By designing play situations in which a disabled child can manipulate his environment as much as possible by himself, regardless of the extent of his disability, the child can have motor experiences comparable to those of normal children. These experiences give a child a broader range of perceptual sophistication and thus a fuller and more normal base for academic growth and self appreciation.

The following criteria are given for consideration in enhancing the use of play facilities both from the standpoint of serving more people and of making the facility safer.

1. A playground should be easily accessible from the adjacent community over hard surface paths, with ramps placed where necessary.
2. Access within the playground should include a system of hard surface paths. Not only does this improve mobility for the handicapped, but can double as a tricycle path.
3. The play area should be reasonably organized in order that a child who is blind may learn how to locate equipment as he enters and moves about the grounds.
4. Apparatus able to accommodate a greater diversity of children does not need to be drastically altered from those now in use. Rather, they must be placed and modified in such a way as to make them both more safe and accessible. Sharp edges, splinters or poorly designed appurtenances should be eliminated.
5. Playgrounds that are accessible to handicapped children require a certain amount of

adult supervision. The amount of supervision varies depending on the type of handicap the child has, the type of equipment present, and the number of handicapped children using the facility. This may mean that in certain cases, parents will have to accompany their child in order that they may supervise his play. In other cases, a single attendant may be sufficient.

6. A series of small vignettes have been prepared to illustrate some of the many recreational devices that can be incorporated into play grounds and can be used by most handicapped children.

Further information about publications on recreational facilities, facility designs and locations of specific recreational facilities, is listed in the bibliography in the back of this report.

Camping, Cooking and Picnicking

For a camping facility to provide a good range of experiences for nearly everyone, it should generally include the following items:

- Level terrain around high-use areas such as shelters, lavatories, swimming pools or beaches, food preparation areas, etc.
- Swimming facilities.
- Adequate acreage to promote the "camping experience" and buffer zones to instill a sense of remoteness.
- Good recreation potential with prime consideration given to water-based activities.
- Ease of access and good communications.
- Good medical facilities close at hand.

1. **Campsites:**
   - a. Dangerous obstructions should be removed from the general campsite area. Tree branches should be pruned above 8'-6" off the ground.
   - b. Water faucets and comfort facilities should be located no more than 100' to 200' from campsites.
   - c. Access to all areas in the campsite should

Typical Campsite

Interpretive Trails for the Handicapped

■ SIGNS SHOULD IDENTIFY FACTS ABOUT AREA. CONFORM TO RECOMMENDATIONS IN SECTION ON SIGNAGE.

■ PROVIDE RAILINGS OR ROPE ALONG EDGE TO HELP DEFINE TRAIL OR TO WARN OF DANGER AREAS.

■ CHANGE OF TEXTURE HELPS TO IDENTIFY SIGN OR REST AREA. TRAILS SHOULD BE FIRM AND FREE DRAINING.

■ PRECAST CURBS HELP TO DEFINE EDGE OF TRAIL.

be over hard surface paths.

d. Eating and service tables should be set on a hard surface so that they are accessible to everyone.

e. For group camping units, the kitchen area and sleeping areas should be separated from each other, both for reasons of functional segregation and to minimize the impact of the two areas upon the site.

f. Each group unit should have its own water faucet and disposal facilities.

2. **Cooking:**

a. **Fireplaces:**
   1. A fireplace that is raised 18" to 24" off the ground is easier to use from a seated position than a ground level fireplace.

b. **Grills:**
   1. For cooking food over charcoal, a grill is more convenient than a fireplace.
   2. The clearance from the ground to the top of the unit should be a maximum of 30".
   3. Grills should rotate 360°, to allow a person seated in a wheelchair the ability to reach all parts of the grill without having to move.
   4. Grills should be protected by asbestos sheeting placed 1" away from the exterior walls.
   5. Grills should have wings upon which to set utensils.
   6. Grills should be placed where there is hard-surface access.

c. **Water faucets:**
   1. Water faucets located at a 3'-4" height are easily operable by most people.
   2. They should preferably be actuated by a lever rather than by a standard gate valve since levers are easier to operate for the majority of people. If a gate valve is used, it should not have a spring return mechanism. These devices increase the difficulty in opening the valve.
   3. They should be accessible over a hard surface.
   4. A drain should be used to carry away the

overflow either into a drainage system or into a gravel drain.

3. **Picnicking:**
Picnicking is a recreational pastime that is enjoyed by all types of people. With a few alterations, existing picnicking facilities can be used by a greater diversity of people.

The following factors should be considered in the design of picnic facilities:

a. Good access to the site over a hard surface which is free of obstructions.

b. A comfort station and drinking fountain located within 100' to 200' from the picnic area.

c. Level surfaced areas around some picnic tables designed to accommodate wheelchair dependent people.

d. Raised fireplaces.

e. Grills.

f. A picnic shelter area.

g. Picnic tables should be placed on a hard surface at least 3" to 4" wider on each side than the table since certain people such as mothers with strollers, people on crutches, or chair-bound people are unable to negotiate softer surfaces with ease.

h. A 29" minimum of space should be allowed between the bottom edge of the table and the ground to allow a wheelchair to slide under the table.

i. See "Lighting Considerations."

Interpretive Trails

Interpretive trails should be designed to allow for the greatest diversity of people to use them. As such, they will need to be well organized and detailed. The main purpose of interpretive trails is to please and inform.

The following items should be taken into consideration in the design of interpretive trails:

1. There should be a sign at the beginning of the trail in braille and raised or routed letters that gives information on the following items:

a. How long the trail is.

b. The locations of special areas such as rest stops and comfort facilities.

c. The location and height of signs in braille and raised or routed letters (that accommodate both the blind and the sighted population) describing events along the trail and calling out particularly interesting items to view or touch.

d. The meaning of special signals such as textural changes in the walks.

e. Any dangerous areas.

2. **Signs to Assist the Blind:**

a. A 3'-0" high rope line used along at least one side of a trail, and along both sides where the trail curves sharply, is a useful guide to blind people.

b. Knots tied in the rope prior to rest-stops, comfort stations and trail stops let the person know tactilely of their location.

c. Pre-recorded messages may be heard either by pushing a button which activates the recording, or by the use of a continuously worn headset which receives the transmitted message as it comes into range.

3. The trail surface should be firm and clear of debris or obstructions. Materials such as soil cement, compacted trap rock dust, or asphalt are suitable for light or moderate traffic.

Spectator Areas

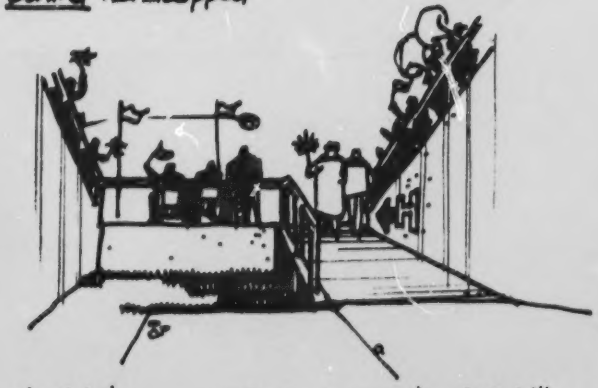
Spectator areas should be provided in locations adjacent to sports functions to allow for at least a minimal side-line participation in sporting events. The same requirements also apply to other spectator areas such as indoor and outdoor theaters.

Amphitheaters

- provide spaces for handicapped and wheelchairs at all levels of amphitheater, accessable by ramp.
- seats should allow extra space for extended leg braces.

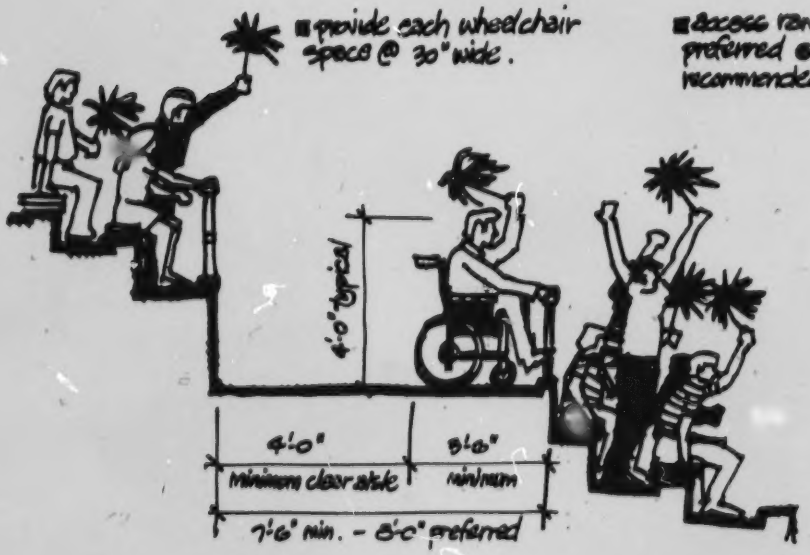
■ space for wheelchair-bound spectators located near entrance ramp minimizes need to maneuver through crowd. Access aisle should be behind handicapped spectators.

■ access to viewing stands from parking should be on firm surface suitable for wheelchairs.



■ provide each wheelchair space @ 30" wide.

■ access ramp min. 4'-0" width, preferred 6'-0". maximum gradient recommended 10%.



Section Through Spectator Stands

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The following factors should be considered in the design of spectator facilities:

1. Spectator areas should be spread out to allow a choice in seating areas.
2. Where possible, these seats should have protection from the sun, rain, and wind but this protection should not diminish vision of the playing area.
3. Spectator areas should have a firm surface with good access.
4. Ramps as well as stairs should be provided.
5. Properly designed areas for wheelchairs.
6. In seating areas with an excess of 75 seats, a minimum of 1 seat or 2% of the total seating (whichever is greater) should be allotted for wheelchairs. Likewise, 1 seat or 1% of the total seating should be designed to accommodate people on crutches or people using walkers.

Boating-Fishing

1. Boating may be enjoyed by many physically handicapped people, provided that a few adaptations are made to accommodate them. The problems are primarily, (1) access to the boat, and (2) the inclusion of supportive devices within the boat itself.

   Specifically, the following factors should be considered:

   a. Access to the docks should be over hard surfaces, free of clutter, and devoid of situations which might prove hazardous for the person with a physical limitation.

   b. Docks should have handrails and railings 3'-0" high, designed in such a way as to allow a person to support himself while he travels along the dock, as well as while he enters the boat.

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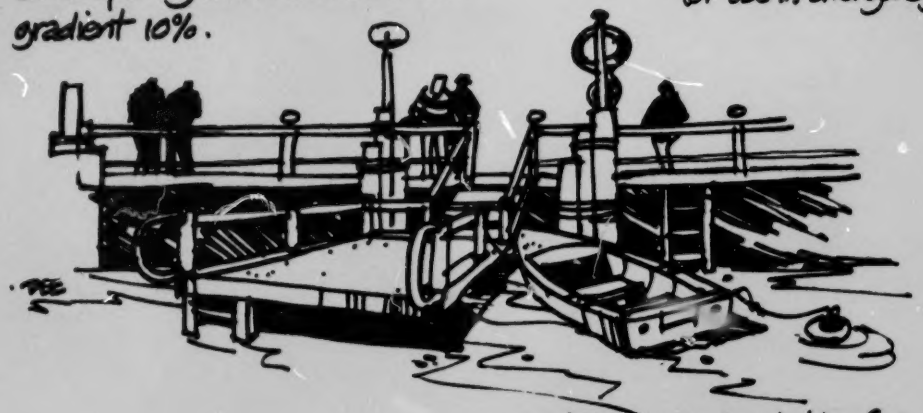
- provide 5 footcandle lighting in ramp and dock areas.
- provide ramp with minimum 32" clear opening width and maximum gradient 10%.
- access to dock area should be across firm paving surface suitable for wheelchair.
- provide life ring and ladders for use in emergency.

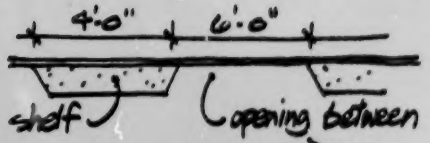


- provide secure handrails for support in walking and to prevent objects or people from falling into water.

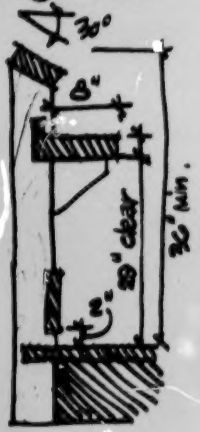
Waterfront Areas

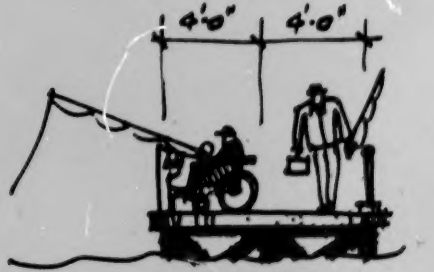
- extended rail support is helpful for added stabilization when entering or loading boat.
- dock heights greater than 18"-24" above water cause difficulty when transferring people or objects from boat to dock.

Boat Access



- sloping top rail is more comfortable for arm rest.
- provide shelf for bait, tackle, etc. Lip at back prevents items from rolling off.
- foot rail provides comfort and prevents objects from rolling off into water.





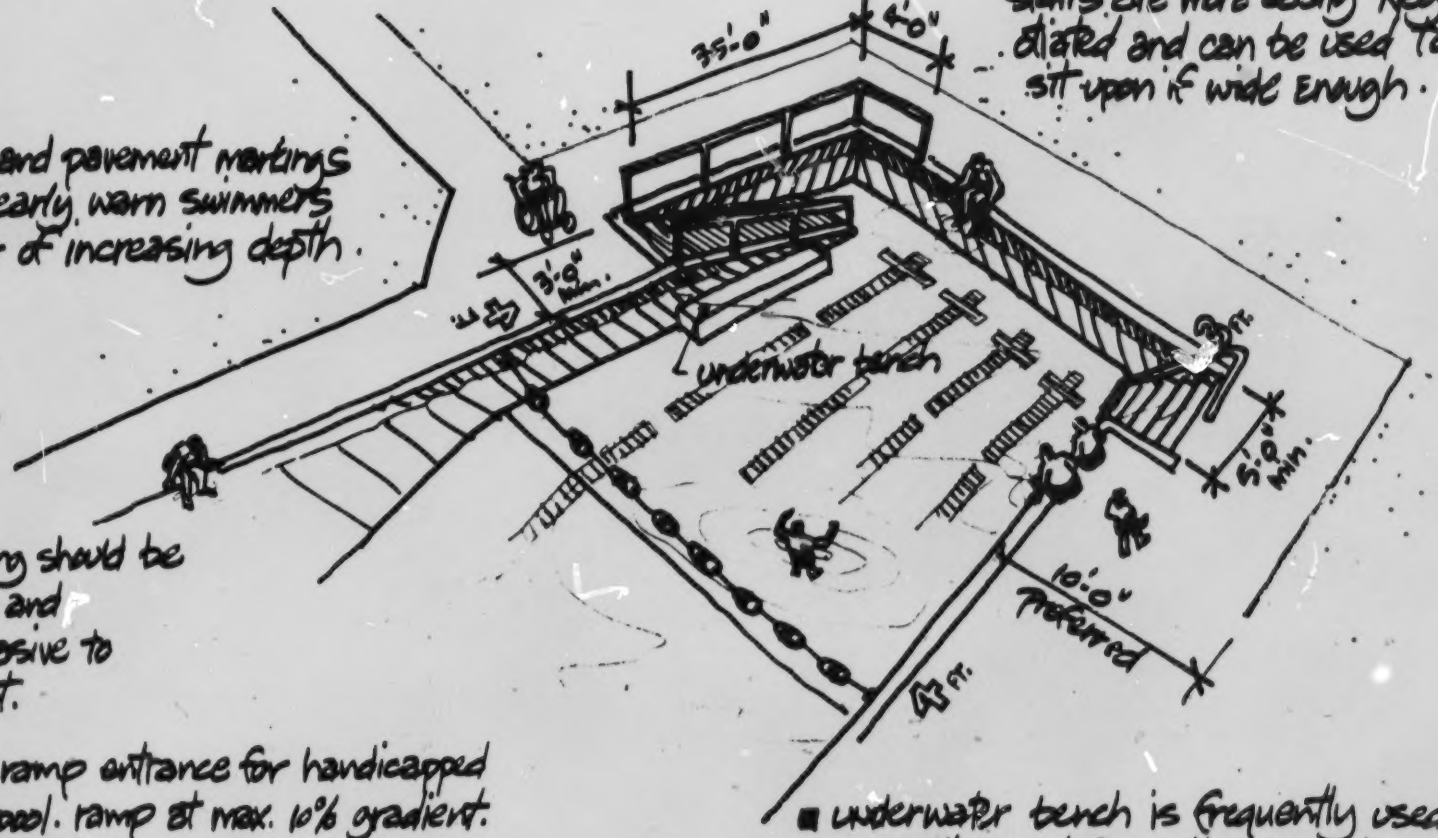
- width of fishing pier or dock should allow free movement of pedestrians when wheelchair is perpendicular to edge.

Fishing Docks & Piers

Considerations for Pool Swimming

■ provide stairs wherever possible rather than a ladder. stairs are more easily negotiated and can be used to sit upon if wide enough.

■ floats and pavement markings should clearly warn swimmers of water of increasing depth.



■ all paving should be non-slip and non-abrasive to bare feet.

■ provide ramp entrance for handicapped to enter pool. ramp at max. 10% gradient. surface should be non-slip and have curb at edge. handrails provided on both sides at 36" height.

■ underwater bench is frequently used by handicapped for resting. location should prohibit other swimmers from jumping from above. use rounded edges throughout.

c. Entry of the boat from the dock should always be from a position perpendicular or parallel to the dock. These two positions allow for the safest entry into a boat.

d. Once within the boat, hand grasps or rails should be provided to assist a person in moving about. This pertains mostly to larger boats, as the addition of such equipment could present more potential hazards than benefits in a small boat or canoe.

2. Fishing is an extremely popular activity for all types of people, and one that is relatively easy to accommodate since all that is really necessary is to provide access to the water.

One should consider the following factors when designing fishing facilities:

a. Hard-surfaced access to and along the water's edge.

b. Access out over the water through one of the following means:
   1. A stable fishing pier that extends far enough out over the water to account for both high and low water lines.
   2. A floating fishing pier built long enough to account for both high and low water lines.

c. Piers should be equipped with railings designed with shelves to accommodate fishing paraphernalia.

Swimming

Swimming has long been considered a popular sport as well as being recognized for its therapeutic value to the handicapped. If a swimming facility is to be designed for therapeutic use in addition to accommodating the general public, a pool is preferred over lake facilities because of better control over water depth, temperature, supervision and sanitation.

1. **Swimming Pools:**

a. Accessibility to swimming pools designed to accommodate a diversity of people can be provided in two ways:
   1. At various locations, the pool coping can be raised above the pool deck 1'-7" and fitted with grab bars that allow people who have difficulty crouching, or who are wheelchair dependent, to first sit and then swing their legs over the side into the water.
   2. The pool coping can be made level with the water with just enough slope to drain off any water splashed from the pool.

b. Along with both of the above types of pool copings, there should be a ramp with handrails, and a set of stairs with handrails, both located at the shallow end of the pool.

c. Pools having more shallow area than is usual are preferred by many people who enjoy the security of knowing they can touch bottom at any time. If diving is a requirement, then an additional pool should be considered.

2. **Lake Swimming:**
The major disadvantages to lake swimming arise for the most part in regard to people who are handicapped, because of lack of control over water depth, temperature, supervision, and sanitation control.

The designer should consider the following items when attempting to make a swimming area accessible to the handicapped:

a. Preferably, the grade of the beach into the water should be no more than 10%.

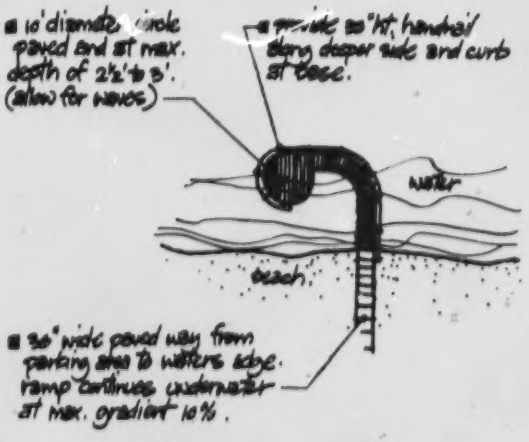
b. An access walk leading to and along the water's edge is necessary.

c. A ramp with handrail along one side extending into the water to a depth of 3'-0" should be provided.

d. The entire swimming area should be well marked with floating markers or signals.

e. Because of the difficulties in regulating a lake swimming facility, the addition of a swimming pool should be considered, especially if the lake is also used extensively for boating, fishing, skiing, and other water functions.

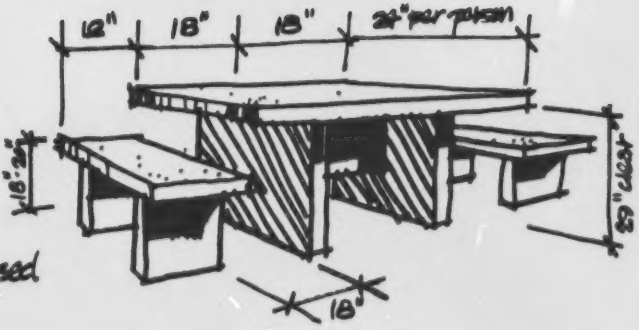
Considerations for Lake Swimming


10' diameter circle paved and at max. depth of 2½' to 3'. (allow for waves)
provide 30" ht. handrail along deeper side and curb at base.
water
beach
36" wide paved way from parking area to waters edge. ramp continues underwater at max. gradient 10%.

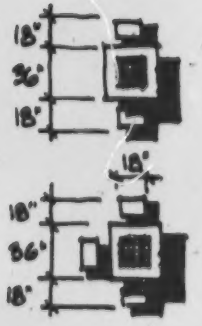
NOTE: length of ramped walk should be adjusted to slope of particular lake profile, (10% max. gradient) and should consider size of anticipated waves.

Site Furniture

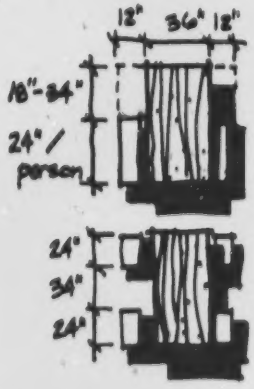
Outdoor Tables



- Table widths @ 18"/person.
- Table lengths @ 24"/person.
- Table heights @ 29"-33" avg.
- Round off or chamfer all exposed corners or sharp edges.
- Keep table tops smooth with no recesses that might hold water or food particles.
- Provide 18" clear leg space under table; measure from outside of table top to nearest support or table leg, etc.



Game Tables



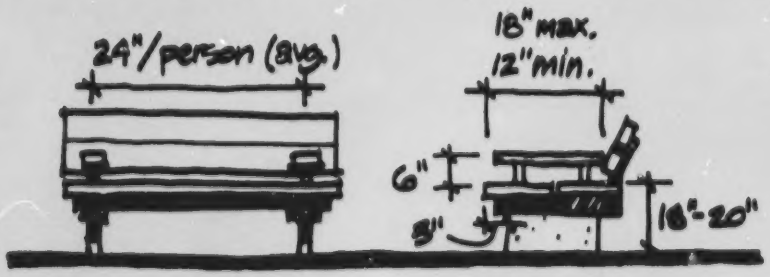
Picnic Tables

The following data represents design recommendations in regard to the most commonly used elements of site furniture. The criteria shown are intended to enhance the use of specific types of furniture by a greater diversity of people.

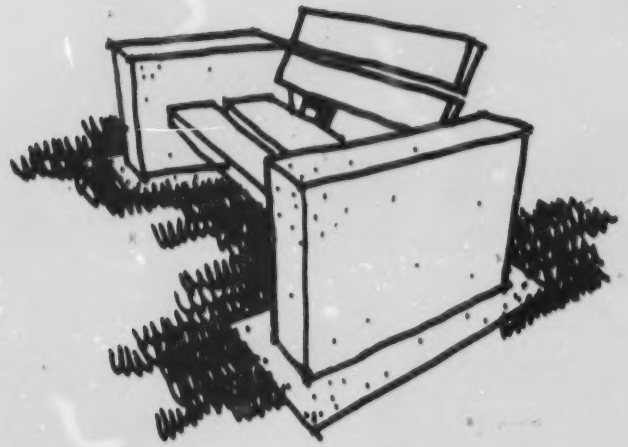
1. **Tables:**
   a. Tables should be constructed with a clear space between the ground and bottom edge of the table of at least 29". This allows wheelchair dependent people to pull up beneath the tabletop.
   b. A lateral space of at least 34" is necessary to account for the width of a wheelchair.
   c. At least some tables intended for public use should be located on hard surface paved areas. Mothers with children in strollers or carriages, people who are physically restricted in their movements, and wheelchair dependent people are better able to gain access to these tables.
2. **Seating:**
   a. Seating should be provided adjacent to paved areas, along walks, near the tops and bottoms of major ramps and stairs, and where otherwise deemed appropriate. It should not be located within a traveled way where it would create an obstruction.
   b. Seat heights in a given area should be uniform and at a height from the ground of 18" to 20".
   c. Seats should be designed with back supports and arm rests. Aside from being desirable from a standpoint of comfort, they also provide support for people rising up off the seat.
   d. Seating should be constructed to support a minimum of 250 lbs. for each person they are designed to accommodate.
   e. A space of 5'-0" should be allowed between the front of a seat and the nearest obstacle. A space 36" wide between ends of benches, or at the end of one bench, allows

Benches & Outdoor Seating

- CHOOSE MATERIALS WHICH DO NOT RETAIN HEAT OR COLD. AVOID ROUGH MATERIALS OR THOSE THAT MAY SPLINTER.
- SITTING HEIGHTS OF 13"-20" ARE PREFERABLE.
- SITTING SURFACES BELOW 12" WIDTH ARE UNCOMFORTABLE FOR MANY ADULTS. LIKEWISE, WIDTHS BEYOND 18" BECOME AWKWARD FOR NORMAL LEG LENGTHS.
- PROVISIONS FOR ARM AND BACK RESTS INCREASE COMFORT. ARM RESTS ARE ALSO HELPFUL FOR SETTING INTO AND OUT OF SEATS AND BENCHES.
- PROVISION FOR HEEL SPACE OF 3" MAKES RISING FROM SEATED POSITION EASIER.
- SEAT SURFACES SHOULD BE PITCHED TO SHED WATER.

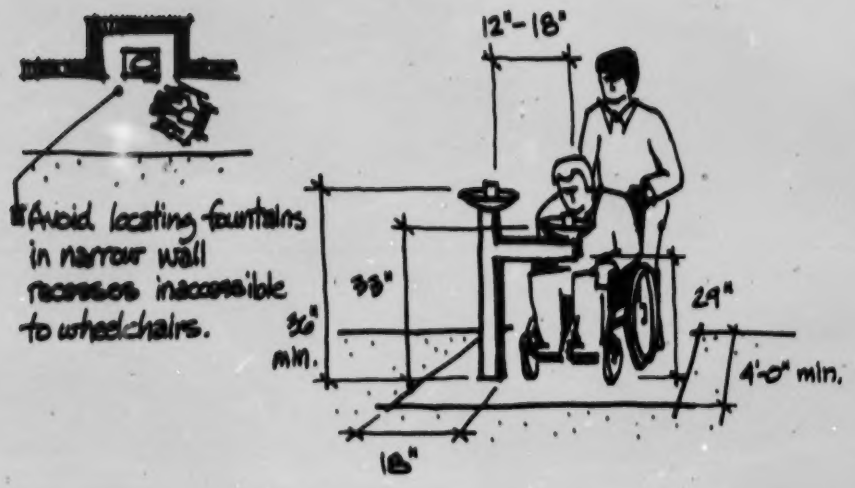


Front View Side View



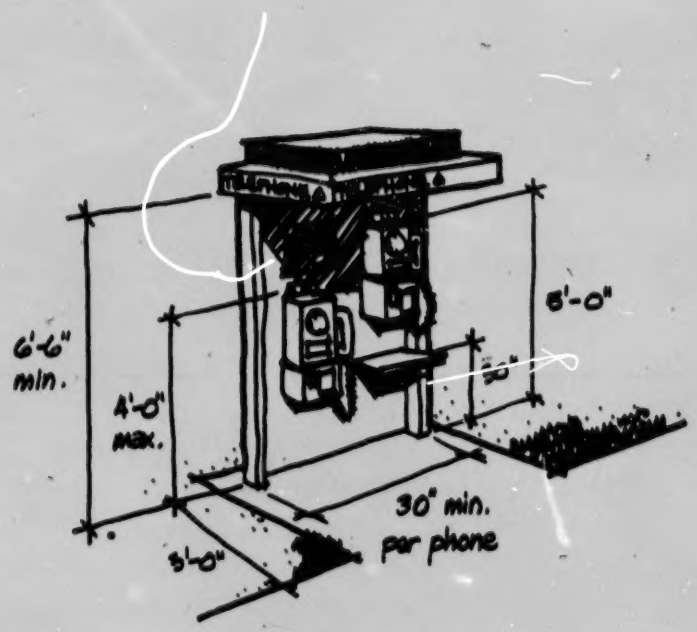
Space Around a Bench

- PROVIDE 24" SETBACK TO KEEP LEGS FROM INTERRUPTING ADJACENT PEDESTRIAN TRAFFIC.
- A 30" MIN. SPACE SHOULD BE PROVIDED TO ALLOW ROOM FOR WHEELCHAIRS.



Drinking Fountains

- Hand operated knobs or buttons and foot pedals are difficult for many handicapped people to operate. Hand levers are preferred.
- Provide a minimum 29" vertical clearance below fountain nozzle to allow wheelchairs leg room for access.
- Nozzle heights should be approximately 33" for wheelchairs and children and 36" to 39" for adults.
- A minimum 18" wide paved area around outdoor fountains avoids both mud and puddles.



Outdoor Telephones

- All groups of telephones should have at least one lower height telephone for use by the handicapped and children.
- Phones for the handicapped should be no higher than 4'-0" at the coin slots. Provisions for braille instructions, volume controls on headsets, and push button dials are helpful for many handicapped individuals.
- Provide adequate lighting on the underside of overhangs for nighttime use.
- Package rests are a helpful convenience to all people.

room for strollers and wheelchairs to park.

3. **Telephones:**
All installations of outdoor telephones should include at least one unit that is usable by people not able to use standard telephones. To this end, the following items should be considered:
   a. Access to the unit should be over a hard surface.
   b. The installation should be located either entirely out of doors or, if enclosed, should be spacious enough to permit access by a wheelchair.
   c. The top of the telephone should be no higher than 4'-0" above the floor.
   d. Public telephones should be operable by push buttons.
   e. Telephone books should be located approximately 30" above the floor.
   f. A fold-up seat should be provided at a height between 18" and 20".
   g. A volume control should be provided in an out-of-the-way place on the telephone to aid the hard-of-hearing.
   h. Consult with phone company for their standards and details offered concerning the needs of handicapped individuals.
   i. Design of surrounding facilities (doorways, openings, hallways, etc.) should comply with operational requirements as outlined in "Basic Human Considerations" section.

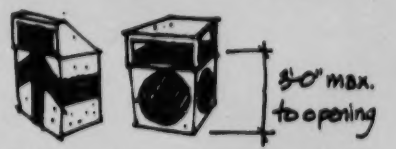
4. **Switches, Buttons, Sockets and Wall-Mounted Appurtenances:**
Switches for lights, buttons for elevators and street crossings, electrical sockets, fire extinguishers, alarm boxes, etc., should be placed no higher than 4'-0" from the floor. Pull down levers or control knobs of any kind should not require more than 8 lbs. of force to operate them.

5. **Drinking Fountains**
In order that a greater diversity of people from small children to wheelchair dependent individuals may be accommodated by drinking fountains, the following items should be considered:
   a. In all areas, fountains should be placed on hard surface areas or immediately adjacent to hard surfaces in order to be accessible to wheelchair dependent people.
   b. It may be necessary to design a free-standing unit that has two fountains; one for normal ambulant adults, and a lower fountain for children and wheelchair dependent people.
   c. Fully recessed fountains should be avoided unless adequate space is allotted for wheelchair access.
   d. Controls for drinking fountains should be hand-operated levers rather than knobs. Spring-loaded return mechanisms should not be used in conjunction with either levers or knobs since the force required to activate these devices is more than some people are able to exert. Both the lever and the bubbler should be located at the front of the fountain.
   e. Stepping blocks, often provided to enable children to reach the bubbler, should be located so as not to interfere with access to the fountain either by totally ambulant people or wheelchair dependent people.

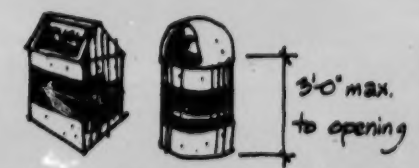
6. **Trash Receptacles**
   a. Trash receptacles should be of a type that may be operated by a single hand movement.
   b. The opening of a trash receptacle should be approximately 3'-0" above the ground. Spring-loaded doors or doors that are foot-operated should not be used.
   c. The receptacle should be strong enough to provide support for people who may require it in order to use the receptacle.
   d. Edges should be crimped, rounded, or smoothed to prevent cuts or abrasions.

Trash Cans & Receptacles

1. Open top easiest to discard trash; open to rain, wind, snow; needs weep holes for drainage; easy to empty; open to insects.



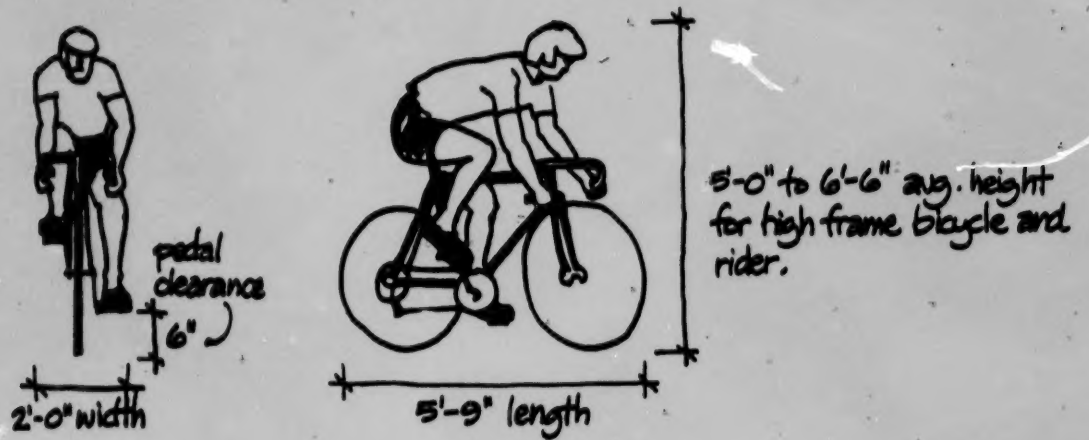
2. Semi-open top gives protection from elements; top hinged to allow removal of trash when unit is full; openings must be designed to accept size of anticipated trash; open to insects.

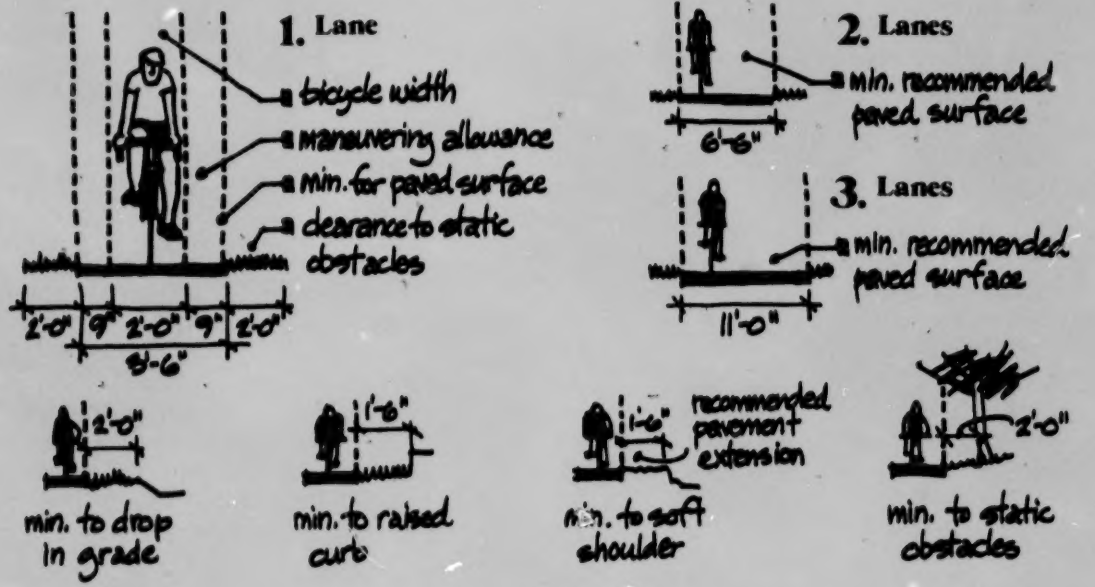


3. Hinged-door openings are difficult for many handicapped people to operate; good protection from elements and insects; openings must be designed for anticipated trash sizes; spring loaded doors should be easily pushed open with one hand.

Bicycle Considerations

General Dimensional Requirements





In Twentieth Century America, the bicycle's primary role has been that of a recreational vehicle. Even though bicycle sales have topped auto sales since 1972, the majority of the adult population still regards the bicycle as a child's toy or as just another fad wrapped up in the environmental movement.

However, a change is taking place. Bicycles are being purchased by adults at a rate that might be described as phenomenal. For short trips, Americans are discovering the multi-speed bicycle to be a viable alternative mode of transportation, particularly in congested urban areas.

Unfortunately, with its many benefits, the bicycle also brings some problems. Accidents involving bicycles have increased proportionately with sales. Partly to blame is the congested nature of most streets and walkways over which cyclists must travel. Poor attitudes toward traffic and safety regulations by both motorists and cyclists also contribute their share of mishaps.

In addition to bicycle accidents, bicycle thefts are also an increasing problem. One recent police estimate is that thefts are running near 25% of new bike sales. No reliable figures are available on the extent of thefts, which in itself is an indication of the lack of interjurisdictional communication, the single greatest police problem in catching up with thieves. To render a bike virtually untraceable by most police methods, all a thief has to do is move it into another police jurisdiction and make his sale.

Perhaps the most all-encompassing problem is that in many areas the person who opts to ride a bicycle is pedaling himself into a severe physical handicap. Choosing a relatively safe route over which to ride, finding adequate parking, negotiating stairways, curbs, drainage grates, dodging automobiles and pedestrians all combine together to make the cyclist a truly handicapped individual.

Though moving slowly, help is definitely on the way. Realizing that bikeway implementation can be an expensive proposition, the Federal Government has legislated various monies for the

funding of bikeway construction and studies. Many state and local governments have followed suit. Police organizations have begun to add bike information on regional computer banks. Cyclist enthusiasts have banded together to form cycling clubs to push for positive action on bikeway development and bike legislation. Manufacturers are also beginning to close the gap between bicycle construction and bicycle security by offering more sophisticated locking systems.

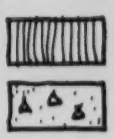
Perhaps the most important measure of all to be taken toward improved bicycling in the United States is the enlightenment of administrators, public officials, and designers. Since most communities are at present without bikeways, what these individuals propose will influence the future development of bike systems for years to come.

In the design of any bikeway system, there are a number of basic considerations to be taken into account by the designer:

1. **Bicycles and Clearances**
   The dimensions outlined on the preceding page are by no means meant to be finite. The intention is to offer basic dimensions of the common 10-speed racing-touring bike and propose certain "common sense" design minimums that have emerged from experimentation. Designers, in all cases, should become aware of local public preferences in bicycle types and adjust their designs accordingly.
2. **Bikeway Surfaces**
   The surface of which a bikeway is constructed is perhaps the single most important feature that the designer must consider. A simple chart showing recommended materials with some basic explanations has been included to help direct the designer in considering surfaces for bikeway construction.
3. **Classification of Bikeways**
   The word "bikeways" has come to be the general term describing any facility reserved for the exclusive or semi-exclusive use of bicycles and related vehicles. Current literature on the subject generally accepts that bikeways may assume any of three basic forms:

   Class I
   Completely separated right-of-way desig-

Recommended Surfaces

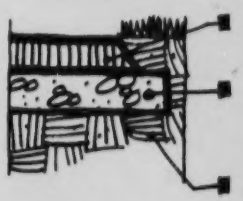


All weather, permanent surfaces:
(most widely used; highest installation costs, longest wearing life; especially good for heavy use in urban areas.)

Loose aggregate, compositional, natural surfaces:
(lower installation costs; high maintenance requirements, susceptible to poor natural drainage; will not stand up to continual heavy use.)

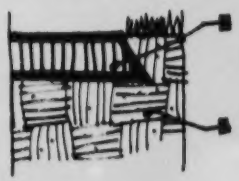
Wood Surfaces:
(use only when laid perpendicular to direction of travel, usually on light bridges, boardwalks, etc.)

Standard Construction

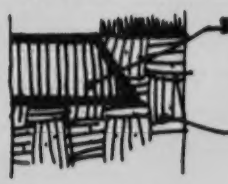


Silts & Clays

Gravels & Sands

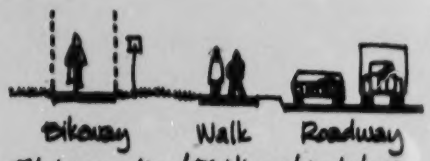


Poorly Drained



Bikeway Classifications

Class I

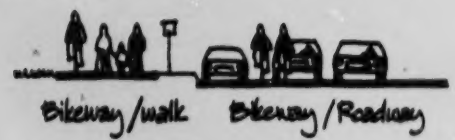


Total separation / Dividing strip between right-of-ways on separate surfaces.

Class II

Total or partial separation / Adjacent, but separated right-of-ways on same surface.

Class III



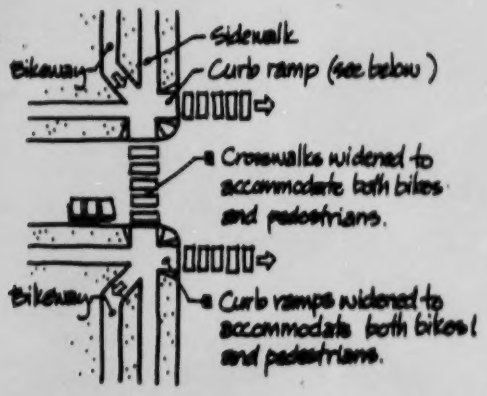
Partial or no separation / Shared right-of-way on same surface

Possible Locations for Bikeways

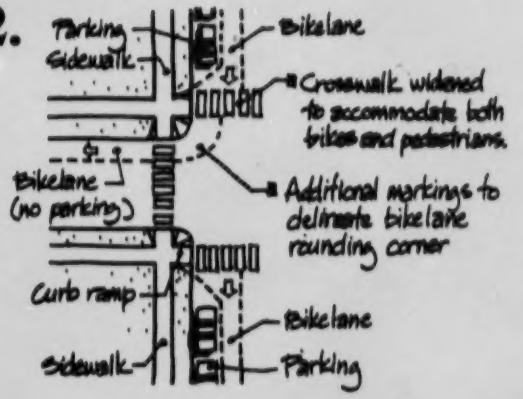
- Abandoned RR right-of-ways
- Electric and pipeline right-of-ways
- River banks
- Dry washes
- Beach fronts, lake fronts
- Flood control dikes and levees
- Irrigation canal banks and dikes
- Fire breaks

Intersections for Bikeways

1.


Sidewalk
Bikeway
Curb ramp (see below)
Crosswalks widened to accommodate both bikes and pedestrians.
Bikeway
Curb ramps widened to accommodate both bikes and pedestrians.

2.



nated exclusively for bicycles. Through traffic, whether by motor vehicles or pedestrians, is not allowed. Cross flows by vehicles and pedestrians are allowed, but minimized.

Class II

Restricted right-of-way designated exclusively or semi-exclusively for bicycles. Through traffic by motor vehicles or pedestrians is not allowed. Cross flows by vehicles and pedestrians are allowed, but minimized.

Class III

Any shared right-of-way designated by signs or stencils. Any pathway which shares its through-traffic right-of-way with either moving (but not parked) motor vehicles or pedestrians.

4. **Design Speeds**
Bicycle speed is determined by several factors which include type of bicycle, gearing ratio, pavement gradients, pavement surface type and condition, wind velocity and direction, air resistance, and the cyclist's age and physical condition. Although bicyclists have averaged touring speeds in excess of 30 mph, a conservative speed for the average cyclist is around 10 to 11.5 mph, with a range of 3 to 19 mph. In determining minimum widths and radii of curvature on level bikeways, 10 mph is a conservative figure for design speed.

5. **Gradients:**
Since cyclists may be discouraged from using a facility in direct proportion to the amount of energy and work rate necessary to overcome any given length of grades on the facility, the importance of developing criteria based upon physiological requirements cannot be overemphasized.
The following are suggested norms and maximums that should be considered when laying out a bikeway route:

Gradient:	Length: Norm	Max
1.5%	1600'	—
3 %	400'	800'
4.5%	150'	300'
10 %	30'	60'

6. **Radius of Curvature:**
At present, accepted radii in the United States vary anywhere from 6'-0" to 50'-0"

When designing radii for bikeway layouts, the designer should use the following formula:

The equivalent radius of curvature as a function of velocity is expressed in the following linear relationship:

$R = 1.25V + 1.4$

Where: R = the unbraked radius of curvature (in feet) negotiated by a bicycle on a flat, dry, bituminous concrete surface.

V = the velocity of bicycle in MPH

Example: For a Class I bikeway, with use speed of 10 MPH, the "comfortable" unbraked radius of curvature is 13.9 feet.

7. **Intersections:**
The most effective way of separating conflicts between cyclists and motor vehicles, where the bikeway must cross a heavily traveled roadway, and heavy bicycle use is anticipated, is to employ a total grade separation. This recommendation also holds true when the bikeway must cross heavily traveled intersections where significant bicycle traffic might disrupt the orderly flow of vehicular traffic.

Generally, in densely populated urban areas with little room for underpasses, providing total grade separation at intersections may be completely prohibitive from the standpoint of costs. This being the case, the designer must then route the bikeway across the roadway at grade. Some of the more typical situations are illustrated in this section.

8. **Parking**
When designing or locating bikeway parking areas, the following items should be considered:

a. Secure stanchions should be provided, (i.e., anchoring of the bicycle frame rather than a wheel alone, since the secured wheel can easily be detached from the frame and the rest of the bike carried off).

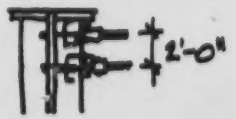
b. Stanchions should be located in areas where there is constant visual supervision.

c. Parking areas should be out of pedestrian pathways.

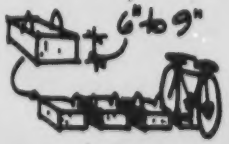
d. Parking areas should be conveniently located near cyclist destination, adjacent to main entries where possible (preferably 50'-0" or less). If distances become too great, cyclists will frequently secure bikes to the nearest available permanent object (i.e., railings, sign posts, light posts, flagpoles, trees, etc.).

Considerations for Bicycle Parking

- 2'-0" spacing allows cyclists to place or remove bikes from racks with minimum of effort and damage.

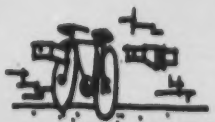


- Racks and stanchions that allow cyclists to lock both frame and wheels reduce casual theft.
- Consider rack and stanchion heights so that excessive cable or chain lengths are not needed to secure both frame and wheels.

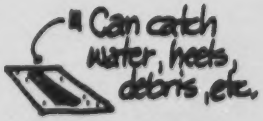


1. Concrete blocks w/ metal rings

2. Steel and wire hoops.



3. Wall racks (arms)



4. Sunken wheel wells w/ rings.

Appendix A: Population Data

Numbers of People with Physical Limitations[1]

Activity Limitations	
None	4,650,000
Limitation in one or more activities	12,928,000
lifting, carrying weights	7,420,000
stooping, kneeling, crouching	9,322,000
using stairs or inclines	7,747,000
walking	6,617,000
reaching	3,650,000
handling and fingering	2,451,000
writing	2,434,000
Unknown	
Personal Care Activities	
No help needed	16,485,000
Needs help (miscellaneous)	1,259,000
in dressing	1,112,000
in personal hygiene	698,000
in eating	281,000
Unknown	10,000
Mobility Limitations	
None	15,645,000
Limitations (miscellaneous)	1,851,000
needs help for transportation	854,000
needs help to go outside home	571,000
confined to home	288,000
confined to bed	137,000
Unknown	257,000
Mechanical Aids	
Non used	15,816,000
Used aids	1,936,000
orthopedic	1,586,000
Sensory Limitations	
None	13,526,000
Limitations	4,099,000
vision impairment	2,820,000
hearing impairment	1,061,000
speech impairment	739,000
Unknown	128,000

Numbers of People with Physical Disorders[2]

Musculo-skeletal disorders	**5,492,000**
arthritis or rheumatism	2,201,000
back or spine impairments	1,952,000
loss or impairment of limbs	874,000
other musculo-skeletal conditions	465,000
Cardio-vascular disorders	**4,408,000**
heart trouble	2,018,000
high blood pressure	966,000
hermorrhoids	204,000
varicose veins	407,000
other cardio-vascular conditions	813,000
Respiratory and related disorders	**1,986,000**
asthma	677,000
other allergies	489,000
chronic bronchitis	220,000
emphysema	149,000
tuberculosis	168,000
other respiratory conditions	283,000
Digestive disorders	**1,284,000**
hernia or rupture	339,000
stomach ulcer	517,000
other digestive conditions	428,000
Urogenital disorders	**451,000**
Endocrine-metabolic disorders	**690,000**
diabetes	487,000
thyroid	203,000
Mental disorders	**1,114,000**
mental illness-nervous trouble	902,000
mental retardation	212,000
Nervous system disorders	**922,000**
epilepsy	171,000
multiple aclerosis	102,000
paralysis	184,000
stroke	257,000
other nervous system conditions	208,000
Sense organs disorders	**620,000**
visual impairments	433,000
deafness	187,000
Neoplasms	**301,000**
Other and not specified conditions	**487,000**

Numbers of People with Physical Limitations[3]

Population Groups	All Ages	Under 17	17-44	45-64	65 & over
TOTAL POPULATION	199,843,000	66,711,000	72,833,000	41,302,000	18,997,000
With Activity Limitations	23,630,000	1,820,000	5,643,000	8,163,000	8,003,000
With Major Activity Limitations	17,747,000	873,000	3,573,000	6,358,000	6,943,000

Numbers of People with Physical Limitations Due to Chronic Conditions[4]

Selected Chronic Conditions	All Ages	Under 45	45-64 years	65+ years
Heart Condition	3,606,000	380,000	1,430,000	1,789,000
Hypertension, without heart involvement	1,187,000	129,000	487,000	571,000
Arthritis and Rheumatism	3,248,000	331,000	1,267,000	1,650,000
Other disease of muscles, bones and joints	781,000	318,000	339,000	124,000
Paralysis, complete or partial	925,000	286,000	278,000	362,000
Impairments (except paralysis and absence) of back and spine	1,796,000	796,000	682,000	318,000
Impairments (except paralysis and absence) of upper extremities and shoulders	410,000	153,000	162,000	95,000
Impairments (except paralysis and absence) of lower extremities and hips	1,351,000	475,000	433,000	443,000

Numbers of People with Mobility Limitations[5]

Capacity Limitations	Number
No mobility limitations	15,645,000
Limitations	1,850,000
Needs help for transportation	854,000
Needs help to go outside home	571,000
Confined to home	288,000
Confined to bed	137,000
Unknown	257,000

Abilities of Audially-Impaired People to Work[6]

Ability to Work	All Ages	Under 45 yrs.	45-64 yrs.	65 yrs./over
With limitation	8,549,000	127,000	115,000	219,000
No major activity	145,000	N/A	N/A	108,000
Limited in amount or kind of major activity	219,000	70,000	63,000	86,000
Limited/not major	97,000	41,000	30,000	N/A
No limits on activity	8,088,000	2,037,000	2,558,000	3,493,000

Numbers of People with Audio Impairments[7]

Both Sexes	Number
ALL AGES	8,549,000
Under 25 yrs.	823,000
25-44 yrs.	1,341,000
45-64 yrs.	2,673,000
65-74 yrs.	1,808,000
75 yrs. and over	1,904,000

Numbers of Visually Impaired People[8]

Visual Impairments	All Ages	Under 25	25-44	45-64	65-74	75 & over
ALL VISUAL IMPAIRMENTS	5,390,000	648,000	744,000	1,499,000	1,126,000	1,373,000
Severe Visual Impairments	1,227,000	53,000	66,000	259,000	263,000	585,000
Other Visual Impairments	4,163,000	595,000	678,000	1,240,000	863,000	788,000

Numbers of People Using Special Aids[9]

Special Aid	All Ages	Under 45	Under 15	15-44	45-64	65 +
Special Shoes	2,377,000	1,620,000	1,263,000	357,000	444,000	313,000
Cane or Walking Stick	2,156,000	94,000	7,000	87,000	444,000	1,618,000
Brace						
Leg or Foot	233,000	152,000	88,000	65,000		
Other	869,000	365,000	61,000	304,000	324,000	180,000
Crutches	443,000	147,000	27,000	120,000	158,000	137,000
Wheelchair	409,000	100,000	24,000	76,000	94,000	215,000
Walker	404,000	N/A	N/A	N/A	57,000	329,000
Artificial Limb						
Leg or Foot	126,000	N/A	N/A	N/A	57,000	N/A
Arm or Hand	46,000	N/A	N/A	N/A	N/A	N/A

[1] **Prevalence of Selected Impairments,** United States, July, 1963; June 1965.
[2] **Chronic Conditions and Limitations of Activity and Mobility,** United States, spring, 1966.
[3] **Current Estimates from the Health Interview Survey,** United States, 1970.
[4] **Chronic Conditions and Limitations of Activity and Mobility,** United States, July, 1965; June, 1967.
[5] **Prevalence of Selected Impairments,** United States, July 1963; June 1965.
[6] Ibid.
[7] Ibid.
[8] Ibid.
[9] National Center for Health Statistics, 1969.

Appendix B: Handicap / Site Element Relationship

Site Elements

Physical Limitations →

Black Dots represent areas where site elements may cause physical barriers for handicapped people if the situation is not given special design consideration.

Each group of people with a specific physical handicap will have characteristic problems with those site elements which require the use of the physical ability which they have lost to one degree or another.

These problems can be categorized in chart form according to the type of handicaps or limitations displayed and the number of site elements which will be placed on a site.

A chart like the one above gives the site designer or project administrator a quick-reference check-list to compare with his site plan. By seeing where problem areas may arise, he can refer back to the design detail section and make sure that specified site elements are not becoming site barriers for the handicapped.

To keep from being redundent, the definitions for the physical limitations have not been reprinted here. They can be found on pages 4 and 5. Likewise, the site elements can be found among the design detail sections.

Appendix C: Current Legislation

State	Legislation & Date Effective	Application of Act	Compliance Adopts ANSI Standards	Covers Remodeling	Covers Leased Buildings	Enforcements: State Buildings	Enforcements: School Buildings	Enforcements: Local Public Buildings	Covers Inspection of New Buildings	Remarks
Alabama	Leg. Act #224 (Eff. 8/9/65).	All bldgs. and facilities used by pub. and constructed in whole or part by State funds, funds of any pol. subdiv., or where any State interests are included.	Complete ANSI spec. adopted.	Yes	Yes	St. Bldg. Comm.	State Bd. of Ed. & St. Bldg. Comm.	Pol. subdiv.	Yes	None
Alaska	Leg. Act #303, Amended by Senate Chapter #119 (1/1/67).	All pub. bldgs. constructed by State or pol. subdiv.	Adopt. ANSI spec. in toto	Yes	Yes	Dept. of Public Works			Yes	Waiver Clause: "The regulations of the department shall conform as far as it is feasible to the standards of ANSI"
Arizona	Leg. Act #113, Chapter #65 (1/1/68). Amended Leg. Act #2045 (July, 1973).	All bldgs. and facilities used by pub. and constructed in whole or in part with State funds of any pol. subdiv., or where State interests are involved. Including temporary and emergency construction.	Complete ANSI spec. adopted.	Yes	Yes	State agen.	Bd. of Regents or Jr. College Dists. or Sch. Dists.	Political subdivisions	Yes	None
Arkansas	Leg. Act #122, House Bill #257 (2/21/67).	Includes all bldgs. of assembly, ed. institutions, and office bldgs. constructed in whole or part with State funds of any political subdivision.	Yes	Yes	Yes	Dept. of Health			Yes	None
California	Assem. Bill #2238, Gen. Assem. 710 (6/7/71).	Includes all pub. funded and pub. used bldgs. Also privately owned bldgs. used by pub.	Yes	Yes	Yes	Director of Dept. of Gen. Service		Pol. subdiv.	Yes, gov't.; no private	Bill also includes sidewalks, curbs, and related facilities.
Colorado	Senate Bill #47 (5/27/65).	Includes all pub. bldgs. constructed by the State or political subdivision of the State.	Yes	Yes	Yes	State Pub. Works Div.	Pol. subdiv., except State Colleges or Univ.	Pol. subdiv.	Yes	None
Connecticut	House Bill #3863, Public Act #216 (6/23/65). Amended House Bill #3518 (1/1/73).	Includes all pub. bldgs. and facilities constructed by State funds or political subdivision funds. Also pub. used – privately owned bldgs.	Required as source of design criteria; regulations promulgated by State agency under leg directive.	Yes	Yes	Dept. of Pub. Works			Yes	Waiver Clause: The public works commissioner can set aside or modify any particular standard or specification when it is determined that it is unpractical and would cause unusual hardship or unreasonably complicate the construction, alteration or repairing of a site or building.
Delaware	Senate Bill #264 (6/30/73).	Pub. funded bldgs.	Partial ANSI criteria contained in law.	Yes	Yes	Secretary of Dept. of Administrative Services			Yes	Waiver Clause: "For good and sufficient reason stated in writing concern severe economic hardship to the State or to the political subdivision involved." Waivers judged by special review committee.
District of Columbia	Executive Order #65-413 (3/30/65).	Pub. funded bldgs.	No	Yes	Yes	Dept. of Bldgs. and Grounds			Yes	Waiver Clause: "Design modifications to accommodate handicapped people shall be made to the extent feasible without adding significantly to the cost of construction."
Florida	Leg. Act #225(19d), Amended (7/1/65), Amended (7/1/72).	Pub. funded bldgs.	Yes	Yes	Yes	"Contracting Authority" in question			Yes	Waiver Clause: "Insofar as financially reasonable in the opinion of said contracting authority, such facilities shall conform with the (standards of ANSI").
Georgia	Leg. Act Senate Bill #412-CA-1 (4/3/72).	Pub. funded bldgs.	No	Yes	Yes	State Fire Marshal			Yes	None
Hawaii	Leg. Act #260, House Bill #158 (7/16/69).	Pub. funded bldgs.	Yes — No but enforcement ag. has rem. policy	Yes		Dept. of Accounting and Gen. Services			Yes	None

State	Legislation & Date Effective	Application of Act	Compliance Adopts ANSI Standards	Covers Remodeling	Covers Leased Buildings	Enforcements: State Buildings	Enforcements: School Buildings	Enforcements: Local Public Buildings	Covers Inspection of New Buildings	Remarks
Idaho	Leg. Act House Bill #21, Chapter #5, (7/1/67).	All pub. bldgs. constructed with State or any pol. subdiv. funds.	Yes	Yes	Yes	Contracting officer or authority of the State or its pol. subdiv.			Yes	Waiver Clause: Facilities and features for the physically handicapped shall be provided "to the extent deemed feasible by the contracting officer or authority of the State or said political sub-divisions. Insofar as is feasible in the opinion of said contracting officer or authority, such facilities shall conform with the (standards of ANSI*").
Illinois	Leg. Act House Bill #2416 (1/1/68).	Pub. owned bldgs., also, pub. used – privately owned bldgs.	Yes	Yes	Yes	Dept. of Gen. Services			Yes	Waiver Clause: "This standard shall be applied to the extent deemed feasible, in cases of remodeling."
Indiana	Leg. Act Chap. #49 (10/24/69).	Pub. owned bldgs.	Yes	Yes	Yes	Administrative Building Council			Yes	None
Iowa	Leg. Act Chap. #104, Code of Iowa Senate File #352 (4/22/65).	All pub. funded bldgs. Also, emergency and temporary conditions.	Yes	Yes	Yes	State Building Code Commissioner			Yes	None
Kansas	Leg. Act Senate Bill #517 (1/1/69).	Pub. funded bldgs.	Yes	If greater than 25% gross area	Yes	Arch. Div. of State Dept. of Admin.		Pol. subdiv.	Yes	None
Kentucky	Senate Bill #167, General Assem. (3/24/66).	All pub. bldgs. constructed by State pol. subdiv. of State.	No	Yes	Yes	State agencies	Pol. subdiv.	Pol. subdiv.	Yes	None
Louisiana	Leg. Act #204, House Bill #100 (6/28/66).	All pub. funded bldgs.	Yes	Yes	Yes	State Fire Marshal			Yes	None
Maine	Leg. Act HP #1114, LD #1583, Creating Part #7 Chapter, #331 (6/6/67). SP #100-LD, #310 (3/13/69). LD #657 (4/2/73).	All pub. funded bldgs.	Yes	Yes, if greater than $100,000	Yes	Public Improvement Director	Comm. of Ed.	Pol. subdiv.	Yes	None
Maryland	Leg. Act Senate Bill #404, added new Sec. #51 to Article #78, A (7/1/68).	Pub. funded bldgs.	Yes	Yes	Yes	Gen. Services Administration	State Dept. of Education	Pol. subdiv.	Yes	Possible Waiver Clauses: This act contains provision stating that barrier-free public buildings and facilities should be suitably marked by an "accessible to the handicapped" symbol. Act also applies to publicly funded, publicly used transportation accommodations which are engaged in mass transportation.
Massachusetts	Leg. Act Senate Bill #1427, Chapter #22, as amended by Chap. #724, Leg. Act #3537 (1/21/68).	Pub. funded bldgs.	Yes	Yes	Yes	Supervisor of Pub. bldgs.	Government body	Pol. subdiv.	Yes	None
Michigan	Leg. Act #1 (7/1/66). Amended Leg. Act #293 (7/1/73).	Pub. funded bldgs. Also, pub. used – privately owned bldgs.	Yes	Yes	Yes	State Bldg. Div.	Dept. of Education	State Bldg. Div.	Yes	None

State	Legislation & Date Effective	Application of Act	Compliance Adopts ANSI Standards	Covers Remodeling	Covers Leased Buildings	Enforcements: State Buildings	Enforcements: School Buildings	Enforcements: Local Public Buildings	Covers Inspection of New Buildings	Remarks
Minnesota	State Building Code (6/1/71).	Pub. funded bldgs. Also, pub. used – privately owned bldgs.	Yes	Yes	Yes	State Bldg. Code Inspector			Yes	None
Mississippi	Leg. Act Senate Bill #2131 (7/1/72).	Pub. funded bldgs.	No	Yes	Yes	State Board of Health			Yes	Waiver Clause: "Except where such compliance is impractical in the opinion of the State Board of Health."
Missouri	Leg. Act House Bill #311 (1967).	Pub. funded bldgs.	No	Yes	Yes	State Planning & Constr. Division	State Dept. of Ed.	Pol. subdiv.	Yes	None
Montana	Leg. Act House Bill #345, Chapter #223 (3/8/65).	Pub. funded bldgs. Also, emergency and temporary bldgs.	Yes	Yes	Yes	State Controller	State Supervisor of Pub. Instr.	Pol. subdiv.	Yes	None
Nebraska	Leg. Act #584 (11/16/65).	Pub. funded bldgs. Also, emergency and temporary bldgs.	Yes	Yes	Yes	Comm. of Labor	Comm. of Ed.	Pol. subdiv.	Yes	None
Nevada	Leg. Act Senate Bill #446 (3/13/73).	Pub. funded bldgs.	Yes	Yes	Yes	Contacting officer or authority			Yes	None
New Hampshire	Leg. Act House Bill #59 (7/1/65).	Pub. funded bldgs.	Yes	Yes	Yes	Dept. Pub. Works	State Board of Ed.	Pol. subdiv.	Yes	None
New Jersey	Leg. Act Assembly Bill #1192, and #355 (1972).	Pub. funded bldgs.	Yes	Yes	Yes	Contracting Authority			Yes	None
New Mexico	Leg. Act House Bill #303, Chap. #194 (3/25/65).	Pub. funded bldgs.	Yes	Yes	Yes	State Construction Industry Board			Yes	Waiver Clause: Any particular standard may be waived if the governing authority responsible for the construction and the board find the requirements: "impracticable."
New York	Leg. Act Chap. #656 (9/1/72).	Pub. funded bldgs. Also pub. used – privately owned bldgs.	Yes	Yes	Yes	Official governing body or board having design approval authority			Yes	516 municipalities subscribe to the State Building Code which provides for accessible construction.
North Carolina	State Building Code (3/13/73).	Pub. funded bldgs. Also, pub. used – privately owned bldgs.	Yes	Yes	Yes	N.C. Dept. of Insurance			Yes	None
North Dakota	Leg. Act House Bill #1129 (7/1/73).	Pub. funded bldgs.	Yes	Yes	Yes	State Construction Superintendent			Yes	Waiver Clause: In cases of practical difficulty, unnecessary hardship, or extreme differences, the State construction superintendent shall grant exceptions from the literal requirements of the standards provided by this act or permit the use of other methods or materials, but only when it is clear or evident that reasonably equivalent facilitation and protection are thereby secured.
Ohio	Leg. Act #124, General Assembly (1/1/66).	Pub. funded bldgs.	No ANSI spec. required as design criteria.	Yes	Yes	Board of Bldg. Standards			Yes	Waiver Clause: "The Board of Building Standards shall adopt standards, rules and regulations to facilitate the *reasonable* access and use by all handicapped persons of all public buildings and the facilities thereof erected after Jan. 1966. The Board of Building Standards adopted in 1966 the ANSI* standard pertinent to publicly funded buildings. Waiver clause is in Board of Building Standards: "The chief enforcement official may permit variance from the provisions. . . ."

State	Legislation & Date Effective	Application of Act	Compliance Adopts ANSI Standards	Covers Remodeling	Covers Leased Buildings	Enforcements: State Buildings	Enforcements: School Buildings	Enforcements: Local Public Buildings	Covers Inspection of New Buildings	Remarks
Oklahoma	Leg. Act #956 (1/2/66).	Pub. funded bldgs.	Yes	Yes	Yes	Board of Pub. Affairs	Pol. subdiv.	Pol. subdiv.	Yes	Waiver Clause: Facilities shall be provided "For the handicapped to the extent deemed feasible by the contracting authority. Insofar as feasibly and financially reasonable in the opinion of the contracting authority such facilities shall conform with the (Standards of ANSI*).
Oregon	Leg. Act House Bill #1074 (unknown date).	Pub. funded bldgs.	Yes	Yes	Yes	State Fire Marshal			Yes	None
Pennsylvania	Leg. Act #348, Act of Gen. Assem. #235 (9/1/65).	Pub. funded bldgs.	Yes	Yes	Yes	Dept. of Labor and Ind.			Yes	None
Rhode Island	Leg. Act 1964 (1/19/64).	Pub. funded bldgs.	Yes	Yes	Yes	None			Yes	None
South Carolina	Leg. Act House Bill #1438 (4/27/73).	Pub. funded bldgs.	Yes	Yes	Yes	Chief of Engineering Staff of State Budget & Control Bd.	State Ed. Finance Committee	Pol. subdiv.	Yes	Amendment to law includes deduction for renovation of building or facility intended to be used and is actually used by the general public. The minimum renovation required shall include one or more of the following: ground level or ramped entrance, free movement between public use areas and washroom and toilet facilities accessible to and usable by physically handicapped people.
South Dakota	Leg. Act Senate Bill #162, Chapter #312 (7/1/65).	Pub. funded bldgs.	Yes	Yes	Yes	State Engineer			Yes	Effective 7/1/71, the international symbol of access must be displayed at the entrance of public buildings and facilities in SD if such structures have provisions to accommodate wheelchair users.
Tennessee	Leg. Act Senate Bill #641, Chapter #484 (2/25/70).	Pub. funded bldgs.	Yes	Yes	Yes	Department or agency of State or subdiv. which has primary responsibility for design of pub. bldgs.			Yes	Waiver Clause: "The minimum specifications shall be complied with . . . unless the Responsible Authority (in his respective area) shall determine that compliance is reasonably impracticable from either an architectural or a financial standpoint, in which event such compliance as is reasonably practicable shall be effected."
Texas	Leg. Act Senate Bill #111, Chapter #324 (1/1/70).	Pub. funded bldgs. Also, Fed. funded bldgs.	Yes	Yes	Yes	(higher ed. pol. subdiv.) State Bldg. Commission with legal support from District Court			Yes	None
Utah	Leg. Act 1969 (no date).	Pub. funded bldgs. Also, pub. used – privately owned bldgs.	Yes	Yes	Yes	State Bldg. Board	State Board of Ed.	Pol. subdiv.	Yes	None
Vermont	Leg. Act House #49 (7/1/67).	Pub. funded bldgs.	Yes	Yes	Yes	Dept. of Pub. Safety	State Board of Ed.	Dept. of Pub. Safety	Yes	Waiver Clause: "The building construction specifications at the time of construction shall, as far as practicable, be equal to ANSI 117.1*.
Virginia	Leg. Act Chapt. #539 (6/26/70).	Pub. funded bldgs.	Yes	Yes	Yes	Director of the Div. Office of Engineering and Bldgs.			Yes	None
Washington	Leg. Act House Bill #841 (1971).	Pub. funded bldgs.	Yes	Yes	Yes	Bldg. Dept. of respective pol. subdiv.			Yes	None

State	Legislation & Date Effective	Application of Act	Compliance Adopts ANSI Standards	Covers Remodeling	Covers Leased Buildings	Enforcements: State Buildings	Enforcements: School Buildings	Enforcements: Local Public Buildings	Covers Inspection of New Buildings	Remarks
West Virginia	Leg. Act House Bill #676 (7/1/09).	Pub. funded bldgs.	No	Yes	Yes	Director of Div. of Vocational Rehab. of State Board of Ed.			Yes	Waiver Clause: "The director shall have the authority to exempt buildings and facilities from the provisions of this article . . . in whole or part, if, in his opinion, compliance therewith would create a financial hardship, be impractical or serve no benefit.
Wisconsin	Leg. Act #30, Chapter #207 Laws of 1969 (7/1/70).	Pub. funded bldgs. Also, pub. used – privately owned bldgs.	No	Yes	Yes	Pol. subdiv. and State Dept. of Ind., Labor and Human Relations			Yes	Limited to providing "reasonable means of ingress and egress by the physical handicapped . . ."
Wyoming	Leg. Act S.F. #71 (1/1/70).	Pub. funded bldgs.	Yes	Yes	Yes	State Fire Marshal			Yes	Waiver Clause: "If it appears that said features would impose an unreasonable expense upon the contracting authority which would more than offset the benefits obtained by their inclusion. The State Fire Marshal, with the advice & counsel of the Director of Vocational Rehabilitation, may waive said requirements."

*ANSI refers to American National Standards Institute for making buildings and sites accessible to and usable by the physically handicapped ANSI-117.1, (1971).

Appendix D: Individuals & Organizations Contacted for Information

Individuals Contacted

Barbara Allan, Easter Seal Society, 521 Second Ave. West, Seattle, Washington 98119

Kathaleen C. Arneson, Rehabilitation Services Administration, Dept. of H.E.W., Room 3014 South Bldg., Washington, D.C. 20201

Kenneth Arutunian, Arutunian Kinney Associates, 360 Bryant Street, Palo Alto, California 94301

Richard Austin, Dept. Landscape Architecture, Seaton Hall, Manhattan, Kansas 66506

E.M. Avedon EDD, University of Waterloo, Ontario, Canada

Richard Blakely, Dept. of Landscape Architecture, 25 Agricultural Hall, University of Wisconsin, Madison, Wisconsin

Thomas Borrellis, Griswold, Winters and Swain, 1101 Greenfield Ave., Pittsburgh, Pa. 15217

Thomas O. Byerts, Director, Housing and Environment, Gerontological Society, Suite 520, One DuPont Circle, Washington, D.C. 20036

Donato Capozzoli, Director, Recreation and Camping Services, N.Y. Association for the Blind, 111 59th St., New York, New York 10022

Leon Chatelain, Jr. FAIA, Chatelain, Samperton and Nolan, 1625 K Street, N.W., Wash. D.C.

Alex Clark, Vancouver, B.C.

Mrs. P. Cluff, Cluff and Cluff, Architect, Toronto, Ontario, Canada

Elizabeth H. Coiner, National Park Service, Washington, D.C.

H. Paul Cowley, Ribera and Sue, 661 Twenty-seventh St., Oakland, California 94612

D.E. Curren, Canadian Paraplegic Association, Atlantic Division, Halifax, N.S.

Richard Dattner, Carnegie Hall, 57th and 7th Ave., New York, New York

Richard K. Dee, Principal, Johnson and Dee, Landscape Architects and Urban Designers, Avon, CT 06001

Miss J. Duchemin, Canadian Council on Social Developments, Ottawa, Ontario, Canada

Margaret Elliott, Rehabilitation Foundation for the Disabled, London, Ontario, Canada

Erwin Friedman, Director, National Children's Center, 6200 2nd Street N.W., Washington, D.C.

Deborah Greenstein, Dept. of Housing and Urban Development, Washington, D.C. 20410

Charles Gueli, Director, Community Design Research Programs and Government Project Manager, U.S. Department of Housing and Urban Development, Washington, D.C., 20410.

Ms. M.R. Hamilton, Royal Ottawa Hospital, Ottawa, Ontario, Canada

Mr. D. Henning, Division of Building Research, National Research Council, Ottawa, Canada

Dorothy Jeffery, Coordinator of Public Affairs, Easter Seal Society, Worcester, Mass. 01608

Dean A. Johnson, Principal, Johnson and Dee, Landscape Architects and Urban Designers, Avon, CT 06001

W.L. Katelnikoff, Walter L. Katelnikoff, Architect, Winnipeg, Manitoba

William Kerwin, Smith Kerwin Inc., Mercantile Bldg., Towsen, Maryland 21204

Joseph Konchelk, Dept. of Design and Environmental Ecology, Cornell University, Ithaca, N.Y.

Barbara M. Laging, Design Consultant – Interiors, 1140 South 20th, Lincoln, Nebraska 68502

Peter Lassen, Health Care Facilities Service, Veterans Administration, 810 Vermont Ave. N.W., Washington, D.C. 20420

Ira Laster, Office of Program Coordinator, Office of the Secretary for Environment and Urban Systems, Department of Transportation, 10405 Nassif Bldg., Washington, D.C. 20590

Thomas Laswell, Ethel Percy Andrews Gerontology Center, University of Southern California, Los Angeles, California

Morton Leeds, Dept. of Housing and Urban Development, Washington, D.C. 20410

Edmond J. Leonard, Director of Information, The President's Committee on Employment of the Handicapped, Washington, D.C. 20210

Robert J. Lynch, Robert John Lynch and Company, Inc., 440 Pleasant Street, Malden, Mass. 02148

Robert Marans, Survey Research Center, Institute for Social Research, University of Michigan, Ann Arbor, Michigan 48106

Edward H. Matthei, Perkins and Will Architects, Inc., 309 West Jackson Boulevard, Chicago, Illinois 60606

Lida L. McCowan, Cheff Center for the Handicapped, R.R. 1 Box 171, Agusta, Michigan

Rita McGaughey, Consultant – Education & Training, National Easter Seal Society for Crippled Children & Adults, 2023 W. Ogden Ave., Chicago, Ill. 60612

Donald J. Molnar, Division of Campus Development, University of Illinois, 610 South 6th Street, Champaign, Illinois 61820

James E. Moulder, Executive Vice President, R.W. Booker and Associates, Inc., 1139 Olive Street, St. Louis, Missouri

Dr. John Nesbitt, Chairman, Recreation Education Program, University of Iowa, Iowa City, Iowa

Edward H. Noakes, Noakes and Associates, 7315 Wisconsin Ave., Bethesda, Maryland 20014

T.J. Nugent, Rehabilitation-Education Center, University of Illinois, Champaign, Illinois 61820

Robert O'Boyle, O'Boyle Associates, 521 S. Riverview, Kalamazoo, Michigan 49004

David C. Park, Exec. Sec., National Therapeutic & Recreation Society, National Recreation & Park Association, 1601 N. Kent St., Arlington, VA

James A. Parker, General Services Administration, 19th and F St. N.W., Room 3046, Washington, D.C. 20405

Leon Pastalan, Institute of Gerontology, University of Michigan, Ann Arbor, Michigan 48106

Janet Pomeroy, Director, Recreation Center for the Handicapped Inc., San Francisco, California

Charles Redmond, Recreation Facilities for the Handicapped, Division of State and Private Assistance, National Park Service, Wash., D.C.

Gary O. Robinette, Executive Director, American Society of Landscape Architects Foundation, McLean, VA 22101

George Rose, L.A., George Washington National Forest, Federal Bldg., Harrisonburg, Va. 22801

Dr. Joel S. Rosen, Assistant Medical Dir., Rehabilitation Institute of Chicago, 401 East Ohio St., Chicago, Illinois 60611

Harry Saunders, Director, Buildings and Grounds, L.A. Unified School Dist., San Pedro, Calif.

Sylvia Sherwood Hebrew Rehabilitation Center for the Aged, 1401 Center Street, Boston MA.

Thomas A. Stein, Curriculum in Recreation Administration, University of North Carolina, Chapel Hill, North Carolina

Organizations Contacted

Harvey A. Stevens, Superintendent, Central Wisconsin Colony and Training School for Mentally Retarded, Madison, Wisconsin

James W. Wahner, State Representative, Room 322 West, State Capitol Bldg., Madison, Wisconsin 53702

Rodney Warmington, Architect, Brisbane, Aust.

Harold Wilson, Staff Economic Analyst, Kaiser Foundation, Ordway Building, Room 2666, Oakland, California 94604

Herb Wolf, Superintendent, Maryland School for the Blind, 3045 Taylor Avenue, Baltimore, Md.

Alexander Graham Bell Association for the Deaf, Inc., George W. Fellindorf, Exec. Dir., 1537 35th St. NW, Washington, D.C. 20007

American Association for Rehabilitation Therapy, Inc., P.O. Box 93, North Little Rock, Ark. 72116

American Association of Workers for the Blind, Inc., John L. Naler, Exec. Sec., 1511 K St. NW, Washington, D.C. 20005

American Association on Mental Deficiency, George Sologanis, Exec. Sec., 5201 Connecticut Ave. NW, Washington, D.C. 20015

American Cancer Society Inc., 521 West 57th Street, New York, New York

American Congress of Rehabilitation Medicine, 30 N. Michigan Ave., Chicago, Illinois 60602

American Corrective Therapy Assoc. Inc., Robert W. Crist, 19 Barnes Court, Hampton, Va. 23364

American Diabetes Association Inc., 1 East 45th Street, New York, New York

American Foundation for the Blind Inc., 15 West 16th Street, New York, New York 10011

American Hearing Society, 919 18th Street NW, Washington, D.C.

American Heart Association Inc., John A. Hagar, Director, Rehabilitation Dept., 44 East 23rd Street, New York, New York 10010

American Hospital Association Inc., 840 North Lake Shore Drive, Chicago, Ill.

American Medical Association, 535 North Dearborn Street, Chicago, Ill.

American National Red Cross, 17th and D Streets NW, Washington, D.C. 20006

American Occupational Therapy Association, 6000 Executive Blvd., Rockville, Maryland 20852

American Orthotics and Prosthetics Assoc., 1440 N Street NW, Washington, D.C. 20005

American Physical Therapy Association, Royce P. Noland, Exec. Dir., 1156 15th Street NW, Washington, D.C. 20005

American Psychiatric Association, 1700 18th Street NW, Washington, D.C. 20009

American Printing House for the Blind Inc., 1839 Frankfort Ave., Louisville, Kentucky 40206

American Public Health Association, 1015 18th Street NW, Washington, D.C. 20026

American Rehabilitation Foundation, Minneapolis, Minnesota

American Speech and Hearing Association, 9030 Old Georgetown Road, Washington, D.C. 20014

The Arthritis and Rheumatism Foundation, 10 Columbus Circle, New York, New York

The Arthritis Foundation, 1212 Ave. of the Americas, New York, New York 10036

Associazione Italiana per l'Assistinza, Agli Spastici, Via Cipro 4/H 000136, Rome, Italy

Association of Rehabilitation Centers Inc., 829 Davis Street, Evanston, Ill.

Association of Swimming Therapy, Honorary General Sec., Mr. J. MacMillan, 24 Arnos Grove, London, N. 11, England

Australian Council for Rehabilitation of Disabled, Cleaveland House, Sydney, Australia 2000

Blinded Veterans Association, Robert D. Carter, 1735 DeSales St. NW, Washington, D.C. 20036

Bureau of Education for the Handicapped, U.S. Office of Education, 7th and D Streets SW, Washington, D.C. 20202

Canadian Rehabilitation Council for the Disabled, 242 St. George Street, Toronto 5, Canada

The Central Council for the Disabled, 34 Eccleston Square, London, S.W. 1, England

Council for Exceptional Children, William C. Geer, Exec. Dir., 1411 S. Jefferson Davis Highway, Arlington, Va. 22202

Council of Organizations Serving the Deaf, Wilde Lake Village Green #310, Columbia, Maryland 21044

Disabled American Veterans, 3725 Alexandria Pike, Cold Spring, Kentucky 41076

Disabled Living Foundation, 346 Kensington High Street, London W14 8NS, England

Federation of the Handicapped Inc., 211 West 14th Street, New York, New York 10011

The Fifty-two Association of New York Inc., Allan Weinberg, Exec. Dir., 147 E 50th Street, New York, New York 10022

Gerontological Society, One DuPont Circle, Suite 520, Washington, D.C. 20036

Goodwill Industries of America Inc., 1913 N Street NW, Washington, D.C.

Handicapped Adventure Playground Association, Mrs. W.J. Pearce, Honorary Sec., 2 Paultons Street, London, S.W. 3, England

The Industrial Home for the Blind, 57 Willoughby Street, Brooklyn, New York 11201

Information Center on Exceptional Children, The Council for Exceptional Children, 1499 Jefferson Davis Highway, Suite 900, Arlington, Va. 22202

Institute for the Crippled and Disabled, Salvatore G. Dimichael, Ph.D. Director, 400 First Ave., New York, New York 10010

International Association of Rehabilitation Facilities, Charles L. Roberts, Co-Exec. Dir., 7979 Old Georgetown Road, Suite 600, Washington, D.C. 20014

International Bureau for Epilepsy, 316 Alfred Place, London, WC1E 7ED, England

International Cerebral Palsy Society, Derek Lancaster-Gaye, Chairman Sports and Leisure Group, 12 Park Crescent, London, W1N 4EQ, England

International Handicappers Net, Ray E. Meyers, Corresponding Sec., Box "R," San Gabriel, California 91778

Joint Council for the Physically and Mentally Disabled, Anne Black Red Cross Bldg., Harcourt Road, P.O. Box 474, Hong Kong

The Joseph P. Kennedy Jr. Foundation, 1701 K Street NW, Suite 205, Washington, D.C. 20006

Junior National Association of the Deaf, Melinda Chapel, Gallandet College, Washington, D.C. 20002

Maryland School for the Deaf, Frederick, Maryland 21701

Muscular Dystrophy Association of America Inc., 1790 Broadway, New York, New York 10019

The National Association for Mental Health, 10 Columbus Circle, New York, New York

National Association of the Deaf, Robert D. Lankenau, President, 1575 Redwood Ave., Akron, Ohio 44301

National Association of the Physically Handicapped Inc., Jack Howard, President, 124 W S Boundary, Perrysburg, Ohio 43551

National Association of Retarded Children, 420 Lexington Avenue, New York, New York

National Congress of Organizations of the Physically Handicapped, Marilyn Siegel, Chairman, 2753 W Farragut Ave., Chicago, Ill. 60625

National Easter Seal Society for Crippled Children and Adults, 2023 W. Ogden Ave., Chicago, Ill. 60612

National Foundation – March of Dimes, Joseph F. Nee, Senior Vice President, P.O. Box 2000, White Plains, New York 10602

National Multiple Sclerosis Society, Sylvia Lawry, Exec. Dir., 257 Park Avenue South, New York, New York 10010

National Parapiegia Foundation, James Smellkamp, Exec. Dir., 333 North Michigan Ave., Chicago, Ill. 60601

National Recreation and Park Association, David C. Park, Director of Therapeutics, 1601 N. Kent Street, Arlington, Va.

National Rehabilitation Association, 1025 Vermont Avenue NW, Washington, D.C.

National Rehabilitation Board, 25 Clyde Road, Dublin 4, Ireland

National Tuberculosis and Respiratory Disease Association, Guilda M. Albert, Field Program Services, 1740 Broadway, New York, New York 10019

Nederlandse Vereniging voor Revalidatie, Stadhouderslaan 142, 'S Gravenhage, Netherlands

New Zealand Crippled Children Society, P.O. Box 1586, Wellington, New Zealand

Paralyzed Veterans of America Inc., 7315 Wisconsin Ave., Washington, D.C. 20014

President's Committee on Employment of the Handicapped, Committee on Barrier Free Design, Washington, D.C. 20210

Professional Rehabilitation Workers with the Adult Deaf Inc., Albert T. Pementel, 905 Bonifant St., Silver Springs, Maryland 20910

Rehabilitation International, Norman Acton, Secretary General, 219 East 44th Street, New York, New York 10017

Sister Elizabeth Kenny Foundation, 1800 Chicago Avenue, Minneapolis, Minn.

Society for Emotionally Disturbed Children, Hugh Pearson, Exec. Dir., 1405 Bishop Street, Montreal 107, Quebec

United Cerebral Palsy Association Inc., Sherwood A. Messner, Director, 66 East 69th Street, New York, New York 10016

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